THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1741.] LONDON, SEPTEMBER 22, 1896. [48TH YEAR. PRICE 6d.

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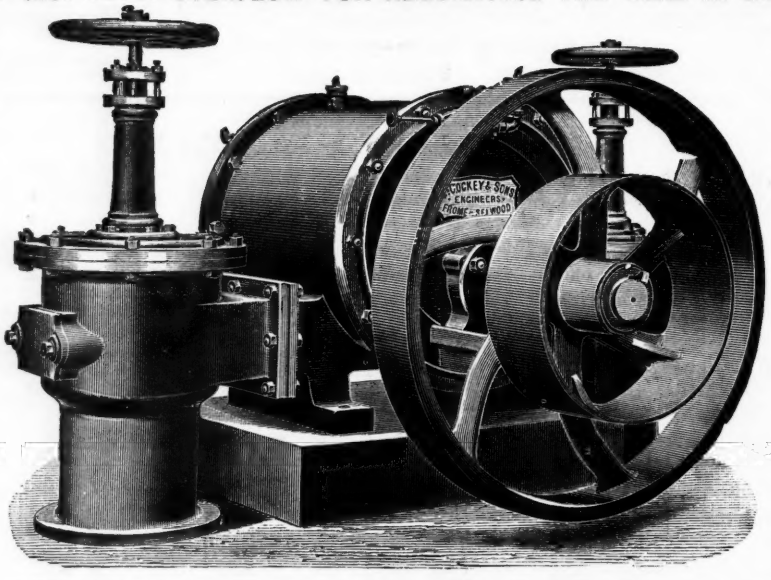

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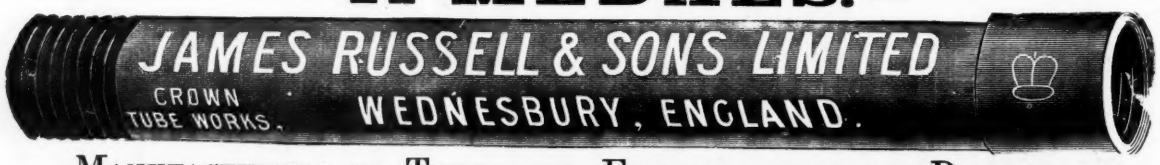

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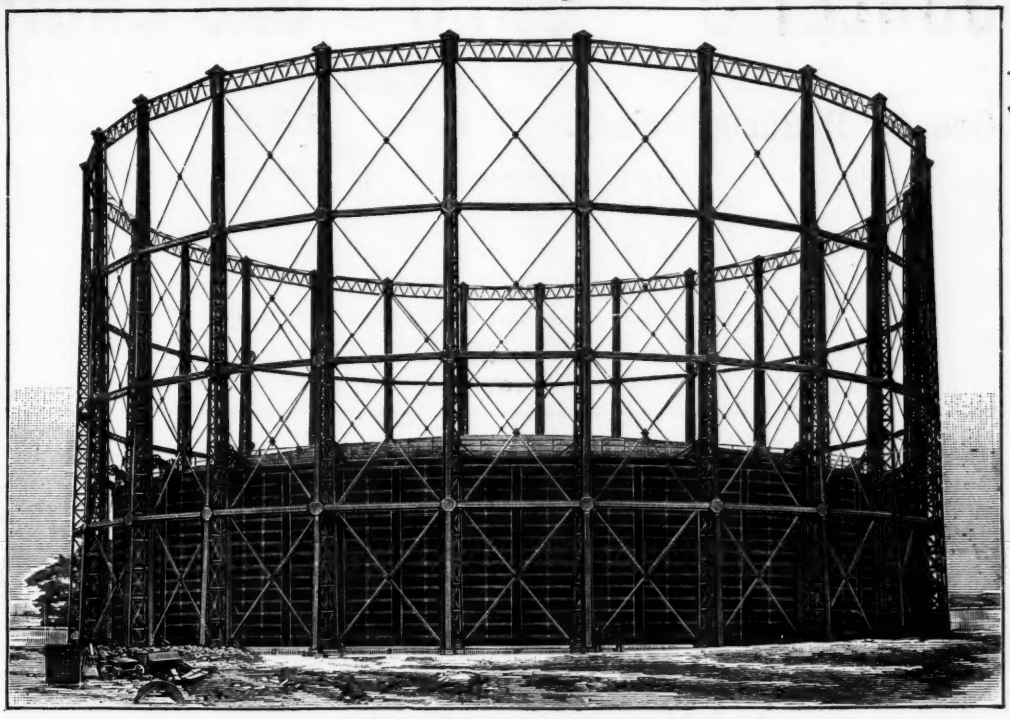

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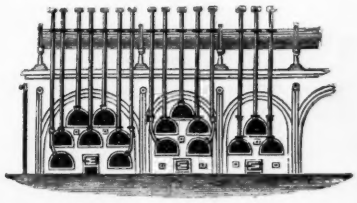

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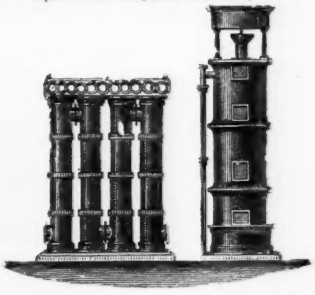

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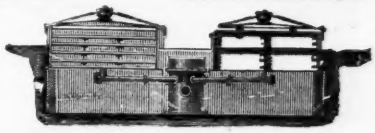

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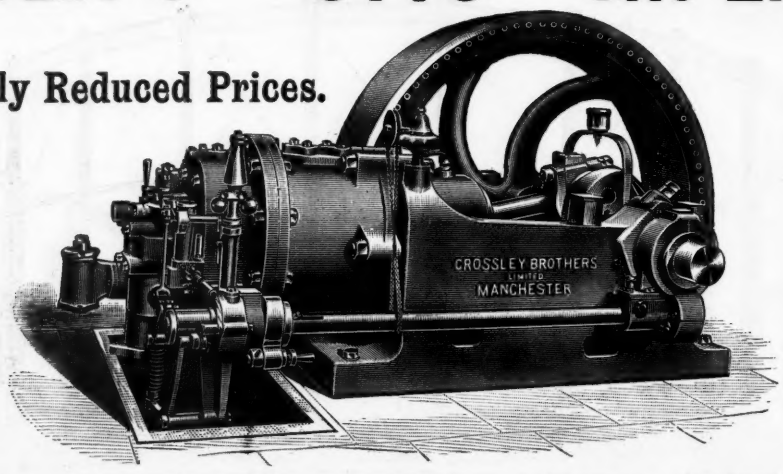

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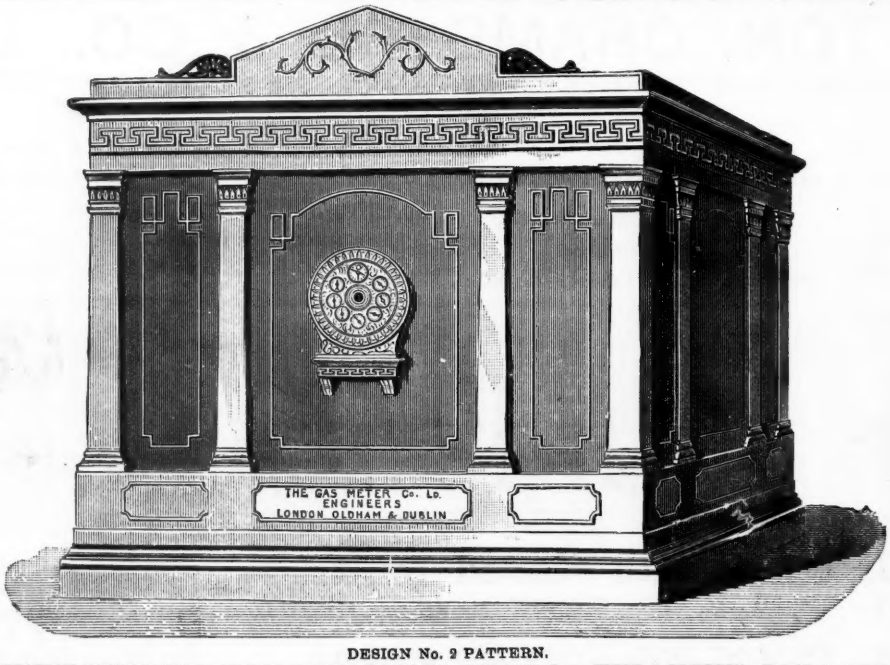

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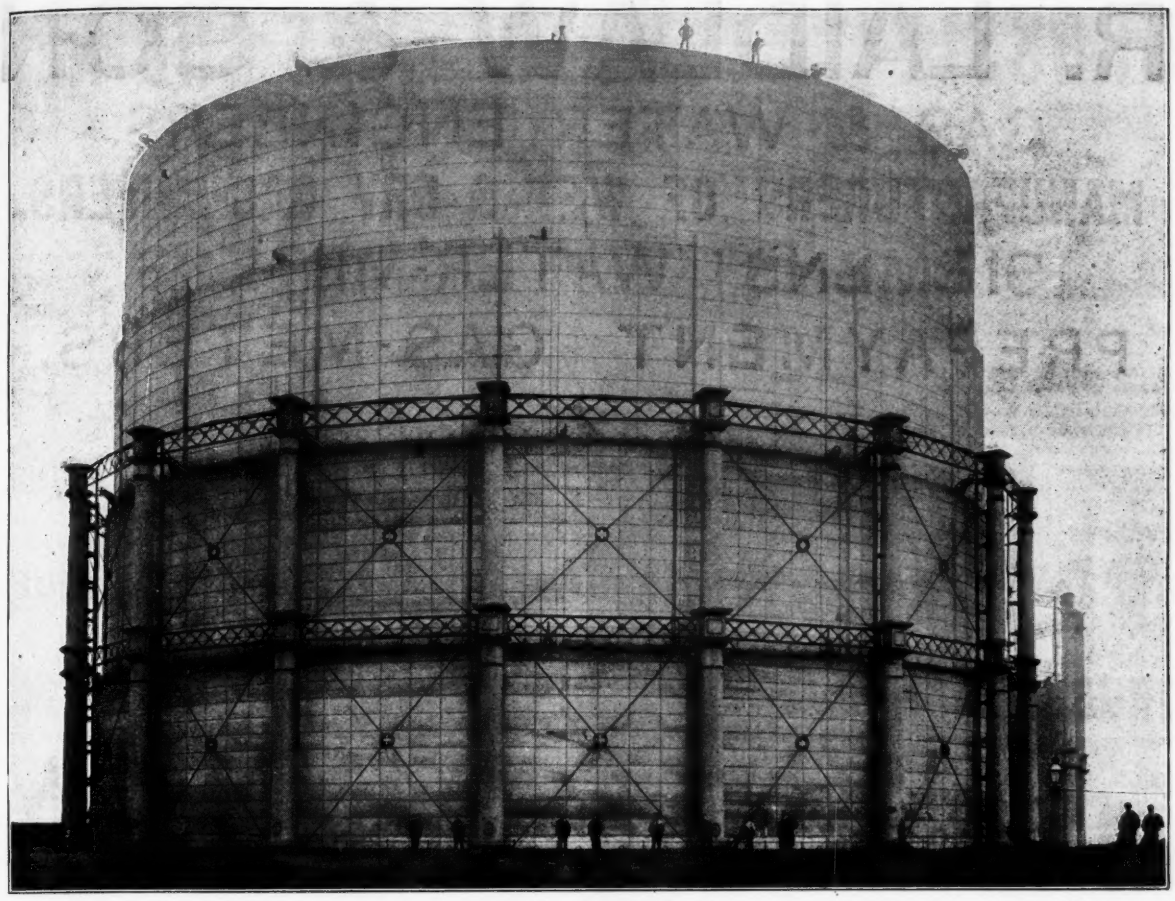

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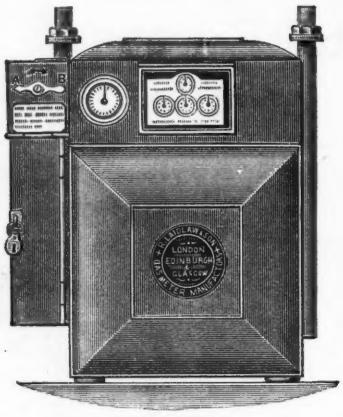

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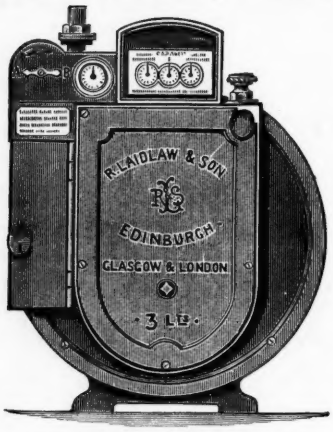

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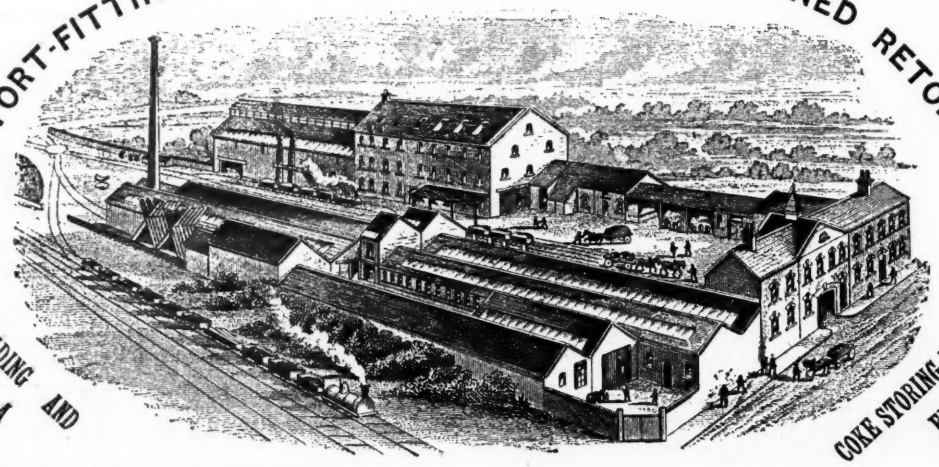

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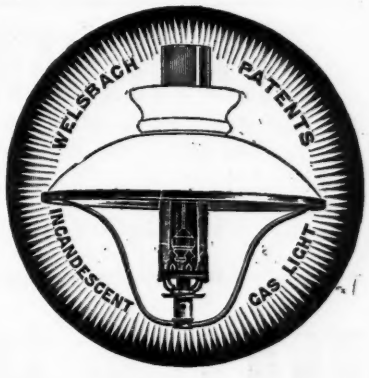

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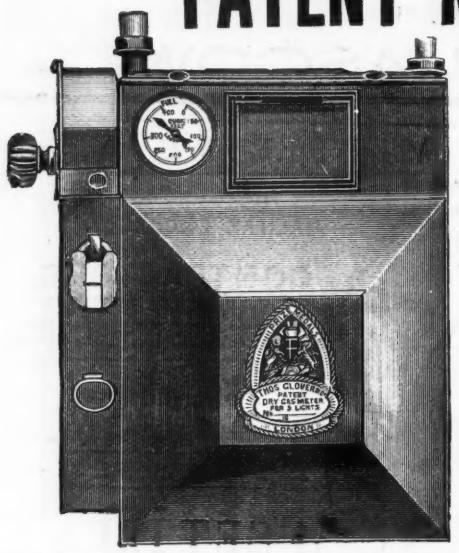

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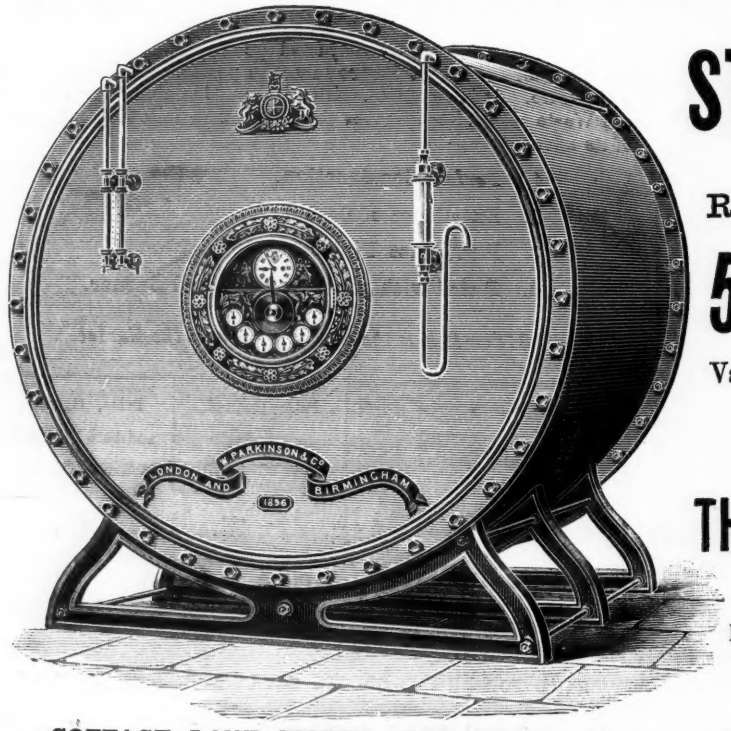

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TO CORRESPONDENTS.

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EDITORIAL NOTES.

Some Observations Made in Glasgow.

THE autumn meeting of the Incorporated Institution of Gas Engineers in Glasgow, an account of which appears in another column, was one of the most successful—perhaps the most successful—of all similar gatherings held under the auspices of the Institution. The event thus amply justified the selection of so far northern a meeting-place for a professional association mainly recruited in the southern parts of the kingdom—or, possibly, this was one of the reasons for the success of the meeting. Nothing was spared by the President of the Institution, Mr. W. Foulis, to make the occasion both instructive and enjoyable; while the hospitality and kindly feeling displayed without stint by ex-Bailie Mitchell, the Convener of the Corporation Gas Committee, were alone worth a long journey to Glasgow to experience. The attendance of members was good, and, so far as could be seen, all stayed over the two days of the meeting—an exceptional thing to be recorded of gas engineers enticed away from their personal connection after the usual summer holiday, and before the new plant put in order for the winter has been brought into service. The day appropriated to the inspection of the Corporation gas-works and other places of industrial interest in Glasgow turned out depressingly wet. But the programme was adhered to with a dogged perseverance beyond praise; and, as if by way of reward, the following day, which was spent on the lower Clyde, was of rare beauty.

It is not, however, of the hospitalities of the Glasgow Corporation and Mr. Foulis, nor of the world-renowned charms of the Clyde, that we desire to write here; but rather to express what must have been in the minds of many visitors to Tradeston and Dawsholm last Thursday respecting the character of these establishments. Glasgow may be, and probably is, entitled to the boast of being the "second city of the Empire," in more than one respect; but it is at all events certain that there is nothing second-rate about the Corporation gas-works, from whatever point of view they are regarded, with the single exception, of course, of size. There is more than a suspicion of vulgarity, however, about pretensions to notice on account of size. There is nothing essentially noble in magnitude, unless it is necessitated by, or subserves some nobler end. The gas-works which turn out a quarter of a million cubic feet of gas a day may be better worth looking over, if the work is done well, than others producing forty million cubic feet daily, and doing it badly. This seems an elementary proposition; but it is nevertheless one that is not properly understood by everybody. At bottom, of course, there is nothing more admirable about a locomotive drawing out a train of coke-trucks from a coke-hold than in the same kind of work when done by a labourer with a wheelbarrow. Such a spectacle as the former always does, however, attract more notice, even from men familiar with the whole thing, than the latter—just as a 48-inch pipe catches the eye that would hardly notice a 6-inch one. To obtain the true help and instruction that a visit to a well-managed large works is capable of affording, this discrimination of dimension should always be kept alert and watchful.

Some things are the better for being big; but the condition is not universal. An ocean steamship, for example, is likely to be so much better as she is bigger than another—all other things being equal, and only one quality, such as speed or economy of working being regarded as determining the point of excellence. This is not the case with gas-works. There is a standard (which it is not our business to set out) beyond which mere bulk becomes a drawback to excellence and economy in gas production, particularly the former. When carbonizing plant surpasses a certain, albeit undefined, magnitude, the prime consideration with the management ceases to be that of obtaining the highest results from the coal carbonized, or the last return from the coke burnt for fuel, and assumes instead the care that everything shall work as smoothly and reliably as possible. It might be practicable to get a little better yield per ton, a larger output per mouthpiece; but the manager, while fully aware of this, knows also that to insist upon its realization would mean to risk breakdowns and other troubles that would cost more in the end than the higher duty would be worth. The responsible head cannot be everywhere at once; and accordingly

he is obliged to wink at some things which, if everything were in his own hands, he might order otherwise. This is the weak point—or one of them—of every large gas-works. On the other hand, the consequences of bad management, or want of foresight, are so magnified in them that he who runs may perceive them.

If the weakness of very large gas-works is the tendency to make things go well and dependably, rather than at their very best, their strength lies in their possibilities of economy in other respects. Coal and coke handling, the saving of labour in stoking and in other respects—these things, when done on the grand scale, afford opportunities which cannot come in the way of the manager of small works. In the Glasgow works, the ultimate realization of such possibilities as are here indicated, if not actually secured, is generally within sight. No living gas engineer can teach Mr. Foulis anything on this score. He has a wide scope for his mechanical aptitude, which is great; and he makes full use of it. Nor does he perpetrate any mechanical pedantry, that we can detect—by no means abolishing the man with a shovel when this kind of agency is meet and sufficient for its purpose. Mr. Foulis is a mechanician of no mean order; and he likes to surround himself with plenty of machines, and these of the very best. But he also knows the present limits of adaptability of machinery, and does not use steam-hammers to crack nuts—to make a fresh application of an old story.

Good commercial management likewise is, or should be, the strong point of the largest gas undertakings, though it is to be feared that such is not always exhibited by or in connection with these large establishments. Companies are liable to be officer-ridden, and boards of directors to be blind to the demerits of trading methods with which they are most familiar. Municipalities are apt to be cheeseparing; to fail to appreciate the value of good service; and to fall into the "penny-wise, pound-foolish" heresy. Great undertakings, however owned, have in the magnitude of their requirements and their output such an enormous power upon the market, that their own momentum is usually, with fairly efficient supervision, competent to secure advantages that smaller concerns can only obtain by scheming, if at all. In Glasgow, the Gas Committee pride themselves on the practice of a pushing commercial policy—not disdaining to seek popularity for their staple product, and making markets for their residuals as assiduously as though they had not the power of squaring their revenue account at any time by the obvious expedient of putting up the price of gas. They have their reward.

The Affairs of the Sheffield United Gas Company.

The half-yearly general meeting of the Sheffield United Gas Company was held last Tuesday, under the presidency of Sir F. T. Mappin, who, as our report of the proceedings shows, spoke at length, and with his usual freedom of expression, upon the affairs of the Sheffield undertaking in particular and the condition of the gas industry of the United Kingdom in general. The Company did not earn their full dividend in the past half year by the sum of £3802; this deficit being accordingly taken from the undivided balance—reducing this fund to the modest sum of £3957, which shows that the Directors are cutting matters very fine indeed. The sale of gas in the Company's district is rapidly increasing again, after a period of comparative quiescence; and the charges for coal and carriage come out favourably. The Directors are very careful over their capital expenditure; and other points might be cited to show how well the Sheffield community are served by their Gas Company. Sir F. Mappin made his great effort, however, when explaining why the Company do no better with their residuals. It is unnecessary for us to repeat or to paraphrase his observations on this head, especially as they mainly consist of a strong impeachment of the commercial management of The Gaslight and Coke Company, in regard to which our own judgment has been pretty often and plainly given in these columns. Before concluding his powerful address, Sir Frederick devoted some weighty remarks to the urgent question of mechanical traction for tramways. How pressing this question is, to different municipalities up and down the country that have acquired the control of their tramway systems, is hardly to be realized by anybody who has no actual connection with the matter. The Corporation of Sheffield are not more interested in the subject than that of Glasgow and of a dozen other large centres of population and industry, wherein horse traction has come to its very last possibilities, without anything obviously better appearing to take its place. The problem of electric lighting is a trifle to that of the future working of the enormous tramway systems upon which the large urban populations of this country, especially of the poorer orders, have learnt to depend for getting to and from their work and their homes cheaply, and at a reasonable rate of speed. Horse traction, we repeat, is becoming impracticable where tramway accommodation is most needed; and still there is nothing but more experiment before those who feel the need for replacing it with something at least as convenient, and more efficient. We learn from Sir F. Mappin that the Sheffield Corporation, like others, have embarked upon the quest for a new tramcar motor; and he very properly takes up the parable of the gas car. It indeed behoves everybody who is likely to be listened to in connection with this subject, to do his utmost to aid our puzzled and anxious municipalities in their quest; and we can therefore all echo Sir Frederick's hope that these inquirers may be guided to a right decision for the benefit of those for whom they labour so painfully. It is not a question whether this or that new system should prosper on anything besides its merits, but that the people shall be served with whatever may be the fittest for the purpose. In this connection, we may venture to offer a suggestion that the Municipality of Sheffield, or some town equally interested in the issue, should offer a substantial prize, to be awarded by a Commission of independent experts and local business men, for the best mechanically-driven car adapted to the existing tramway system. The Commission could, of course, extend their inquiry to the working of all known systems in actual use elsewhere; but, we take it, the need of the hour is a mechanically-driven car that shall be able to run on the existing rails, with the least possible alteration of the permanent features of the system. With the aid of gas, there should be no insuperable obstacle in the way of the realization of this object. We say, with gas—not because the gas industry has anything worth mentioning to gain from the application of this kind of fuel to such a purpose as tramway working, but solely on account of the initial recommendations of the fuel.

The Meeting of the Eastern Counties Association—The Self-Enrichment of Gas.

The Eastern Counties Gas Managers met at Retford on Wednesday last, under the presidency of Mr. A. Drage, of East Dereham. The gas-works there are under the Corporation; and the members were received by the Mayor, and entertained to luncheon by the Gas Committee. The attendance was small, which lent point to a suggestion by Mr. J. T. Jolliffe, of Ipswich, that for the future the Association should be understood to have a centre, and that for geographical reasons Cambridge should be chosen to serve this purpose—the spring meetings being held there regularly. After some discussion, in which the need for doing something to make it convenient for members to attend in force at least one meeting in the year was fully admitted, Peterborough was made the spring centre of the Association by the vote of a majority of members present. The idea of Mr. Jolliffe's suggestion is an excellent one; and experience will show whether the present selection is the best that could be made in the interests of the Association. The first paper read at the meeting was by Mr. R. G. Shadbolt, of Grantham, and bore the somewhat enigmatical title "The Self-Enrichment of Coal Gas." It is a paper that will be read with interest by all gas managers, as it narrates, in a most clear and convincing style, the circumstances of a highly interesting experiment. Like most gas managers at one time or another, Mr. Shadbolt had fallen under the temptation of trying to carburet his gas with tar, when the idea occurred to him of increasing the carrying power for the tar vapours of his crude gas by returning to it a portion of the purified gas. From this it was, as he says, but a step to try the effect of returning purified gas to crude gas without the addition of tar gas and vapours. The paper describes how this was done, and gives the results, which were at first remarkably favourable. Disappointment, however, supervened upon further experience; and the paper becomes almost exciting as it goes on to describe how the author searched about for the secret of his first tantalizing success. He eventually triumphed over his difficulties—

or rather, it should be said, gradually learnt what was the right and the wrong of his experimental process; and at Grantham he claims to have placed beyond doubt the capacity of gas to enrich itself by his method to the extent of 1¾ candles over a period of six months. This is effected, moreover, without noticeable detriment to the commercial value of the tar. It is not too much to say that if anything like these results can be repeated elsewhere, and with different coals, Mr. Shadbolt's process has a great future before it. Mr. W. J. Jenkins, of Retford, also read a very practical paper on "Regenerator Retort-Settings," which was discussed at some length. The next President of the Association is to be Mr. Jolliffe. When the members meet again, it is to be hoped that Mr. Shadbolt will present a supplement to his paper, telling how his system worked through the winter.

The Truth about the Clyde Strike "Settlement."

It is satisfactory to learn, upon the best authority, that the so-called settlement of the recent strike of members of the Amalgamated Society of Engineers at the Govan works of Messrs. Dunsmuir and Jackson—which, as we remarked last week, was no settlement at all—is capable of bearing a totally different construction from that put upon it by the Trade Union interest. The news of the settlement in question was hailed at the Trade Union Congress, and by the newspapers which pander to the Trade Union interest generally, as a victory for this cause; and, certainly, upon the reports that found the greatest circulation among newspaper readers, it was made to appear that the employers had shown some weakness in the matter, while the workman Cook, who was supposed to be figuring as the new Hampden of this movement, had seemingly shown more. The facts were quite different. The truth of the matter is that the associated employers were very firmly resolved to proceed to any extremity in defence of the principle of freedom of labour, although only a single workman was in this particular instance identified with the principle. The man himself, however, had some time previously made arrangements for changing his job; and the opportunity for doing so happened to come just at the psychological moment when the revolted Society men had decided to give up their futile strike, and return at once to their work and their allegiance to the offended Central Executive of their Trade Union. The district delegate who had had so much to do with this local outbreak heard of this circumstance, and, after the manner of his kind, seized upon it as a means of escaping from the deadlock; spreading the report that the sacrifice of Cook was the condition of what was forthwith magniloquently described as the "settle-"ment" of the strike. It is very important that the trade and the public in general should correct their impressions in this regard. There was no settlement, if the term implies anything in the nature of an agreement between the masters and the men relative to the cause of the strike. Whether the man Cook went away in a week or stayed on, was a purely extraneous circumstance entirely within his own disposal. From first to last, the firm refused to discharge the man, or influence him to leave their employment; and the strikers came back to work unconditionally. As if to emphasize the fact that the "principle of recog-"nition of the Union"—meaning denial of work to non-unionists—remained in precisely the same position as before, the firm took advantage of an opportunity presented for engaging another non-society engineer, who has continued at work throughout. Not a word of this has been published in the section of the newspaper press that glorified the supposed "settlement" as a gain to the cause of "Labour." This is one of the most patent and regrettable of the features of the new labour movement, as engineered by the Socialist agitators and the self-styled advanced politicians of our day. Those who pull the wires in the cause of industrial tyranny do not scruple to lie about their proceedings and results whenever they find it expedient to do so. Whether a cause subserved in this way is likely or is deserving to prosper in the long run, is a consideration that the British workman, enfeebled as his native shrewdness has been by foreign-made sophistries, is sure to put to himself before long. It may suit the professional agitators, who live in non-productive fussiness at his expense, to try to keep up their "Fool's "Paradise" to the last moment; but it cannot endure for so long as we trust the honest industries of this country are likely to continue in prosperous activity.

WATER AND SANITARY AFFAIRS.

The great "indignation meeting," designed for the denunciation of the East London Company, has been held at Mile End, under auspices rather less distinguished than was anticipated, and with an attendance by no means overflowing. The "Daily Chronicle" has expressed its regret that Mr. Crookenden and his friends were not present to hear the home truths that were uttered on the occasion. Whatever may be the feelings of the "Chronicle" on this subject, a letter which appeared in the leading journal on Friday last, written by Mr. Crookenden on behalf of the Directors, very conclusively shows that something other than "home truths" characterized the attacks made upon the Company at the Mile End meeting. Accordingly, Mr. Crookenden and his friends lost very little by their absence; and it is only to be regretted that the people who were present heard so much that was contrary to fact. Bringing truth to bear on the question, condemnation seems rather to fall on the speakers than on the Company. Sir Samuel Montagu, who presided at the meeting, censured the East London Directors for not having the new reservoirs ready at an earlier date, and for not taking proper precautions when they saw "danger "ahead." But Mr. Crookenden calls attention to the inconsistent conduct of Sir Samuel, and the other Members of Parliament who were present on the platform, all of whom voted against the Bill of the East London Company in 1894—the measure only escaping defeat by a majority of one. Sir Samuel told his audience last Tuesday, in reference to the works authorized by the Bill, that "had pressure been put on the contractors, the "additional reservoirs would have been ready for storage "purposes." Ready, we suppose, in due time. But pressure was either exercised or not required; for, according to the testimony of the "Daily News" some time ago, and of "The Times" very recently, the works were undertaken with extraordinary promptitude, and were pushed on with the utmost energy. Perhaps the inhabitants of East London will recognize the service rendered by Sir Samuel, in doing his best to prevent the Company from having any additional reservoirs whatever. There is a sort of sublime audacity in the conduct of men who vote one way in Parliament, and talk in another way on a public platform. It is Sir Samuel Montagu and his coadjutors who have mainly caused a failure in the water supply of East London; and if there is any force in the argument that the consumers ought not to pay for a supply which they do not receive, there is equal justice in putting forth a claim for the County Council to make good the difference.

The resolution passed at the Mile End meeting calls upon the Government to constitute the County Council the Water Authority for London, "with full power to "provide new supplies and to purchase the systems of the "existing Companies on fair and reasonable terms." We may couple this with the letter from Sir Arthur Arnold, expressing his conviction that the acquisition of the Water Companies' undertakings is a necessary and inevitable preface to a reform of the water supply of the Metropolis. More significantly, Sir Arthur went on to say, in his letter: "I am hopeful that the London County Council "may, in this recess, make satisfactory arrangements with "Her Majesty's Government for the progress of measures "to this end in the next session of Parliament." As Sir Arthur Arnold doubtless means the acquisition of the undertakings by the County Council, we greatly doubt whether he has an adequate foundation for the hopefulness which he entertains. "The progress of measures to this "end," sounds a little vague. If the County Council had shown a sincere desire to secure an immediate and adequate supply of water for the Metropolis, by supporting the Bill of the East London Company, instead of opposing it, they would have commended themselves to the confidence of the public and the approval of Parliament. Such a proof of disinterestedness would have placed them in a commanding position; and they would have stood a far better chance of becoming the Water Authority in the Metropolis than any they now possess. They might have followed on with their Welsh scheme, or any other; and both Parliament and the public would have given ear to them. Their crooked conduct in regard to the Metropolitan Water Supply has only to be brought into the clear light, in order to secure their condemnation as pursuing a

strategic course for their own aggrandisement. The professions made by the speakers at the Mile End meeting render evident the hypocrisy of the Progressive party in holding up their hands in horror at the failure of the East London water supply, when they are themselves directly responsible for what has happened. An attempt is made, by this lamentation over East London, to blind the public to the fact that while the East London Company have been doing their utmost to maintain the supply, the Progressive party in the County Council and in Parliament have been pulling the opposite way. An adequate supply is exactly what Progressives do not want to see; for it would show that their intervention is not required.

We have felt it our duty on several occasions to refer to the misrepresentations and unsound arguments which have appeared in the columns of "London" respecting the Metropolitan Water Companies. We are sorry to find there is more cause than ever to complain of our contemporary. In the last issue of that paper, language of the most abusive kind is employed in attacking the East London Company. We are told that the Company stand disgraced, they have invented excuses by the dozen, they have not been honest, they have adopted a cowardly device, and finally they are accused of criminal neglect. We wish it were possible for the East London Directors to bring an action against "London," and so to call upon that paper to show where the "criminal neglect" is to be found. The accusation may be treated for what it is worth, which is little enough; but it is a scandalous charge to be made—put forth as it is without an atom of proof to support it. In the absence of anything definite, perhaps we may fall back on the statement made by Sir Samuel Montagu at the Great Assembly Hall, and which is thus reported in "The Times": "There was one charge "the Water Company could not refute, and that was that "they did not apply for assistance from the New River "Company until questions had been asked in the House "of Commons." In Sir Samuel's opinion, the Company should have applied for help "three months earlier." It is wonderful what prescience is expected of a Water Company. It was at the end of July that Mr. Chaplin was able to announce in the House of Commons that the East London and the New River Companies had come to an arrangement by which the latter would be able to provide the former with three million gallons of water daily. According to Sir S. Montagu, this ought to have been effected by the latter part of April—the Company being able, we suppose, to excel the Meteorological Office by foreseeing the phenomenal drought of the coming summer. But there is another point. Is Sir Samuel quite sure that the New River Company were in a position to divert a portion of their supply in this manner at an earlier date? The New River Company had a Bill in Parliament during the past session, in which they sought for power to sell water in bulk to any other Company, such Company also to have power to purchase. This would seem to imply that some such power was wanting. The New River Company had their parliamentary limits of supply, and possibly they might not overstep them. It is somewhat singular that the clause for power to sell water in bulk was struck out of the Company's Bill in its passage through Parliament. But apart from the question of any legal difficulty, there is no proof of unreasonable delay. In receiving the deputation which waited upon him early in August, Mr. Chaplin—referring to the purchase of a supplementary supply from the New River Company—said: "I am satisfied that the East London Company "made every endeavour to bring these arrangements to a "quick conclusion." Again we ask: Where is the "criminal neglect"?

North of England Gas Managers' Association.—We have received from the Hon. Secretary of this Association (Mr. W. Hardie, of Newcastle) the notice of the thirty-ninth half-yearly meeting, which will be held at South Shields on the 3rd prox., under the presidency of Mr. J. H. Penney, the Secretary of the South Shields Gas Company. The members, on their arrival, will find tramcars ready to convey them to the seaside, where the Marine Parks, the Volunteer Life Brigade Station, and the South Pier will be visited. They will then proceed to the offices of the Gas Company, where the meeting will be held. The business will consist of the President's Inaugural Address and a paper by Mr. E. H. Millard, of Durham, on "Tools and Material for Main and Service Laying." On the invitation of the Chairman and Directors of the Gas Company, the members will dine at the Royal Hotel in the afternoon.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 558.)

Last week, like its predecessor, was a period of depression in the Stock Markets. Business was far from extensive; but if more buyers could have been found, there were plenty of sellers ready. There was naturally some agitation over Eastern affairs, and the out-spoken denunciation of perfidious Albion by the Continental press; but that after all was an incident. The chief cause of the drop in prices was the enforced sale of securities bought with borrowed money; and things will right themselves when this job is through. It is noticeable, in illustration of this point, that the very best securities are the chief sufferers, although, of course, they remain as substantially sound as ever. The position was saved from considerable aggravation by the Bank rate being allowed to remain unchanged on Thursday. The week closed in a somewhat better mood; the tendency on Saturday being calmer, and disposed to improve. The Money Market may be quoted quiet and steady. Whether the 2½ per cent. rate will last another week is beyond forecast; but circumstances may at any hour occur to render a further rise a matter of certainty. Business in Gas stock during the week has been more interesting, not to say startling, than it has been for a long while; the chief feature being the big drop in South Metropolitans. It almost goes without saying that nothing in relation to the Company's position and prospects has transpired to depreciate its value. Paradoxical as it may seem, the incident may be rather regarded as a proof of the high esteem in which the security is held by the public; and we may ascribe the fall to the same cause which operated the great retrogression in the choicest gilt-edged securities, allusion to which is made above. It is a distinguished rank for a gas stock to have attained—that of being bought, with borrowed money, to pay 3⅜ per cent. But the general depression carried other Companies' stocks more or less down also. Gaslight "A," which had started downhill some time before, was the most affected; but the secured issues stood very firm. Nothing was done in Commercials. They seem quite a fixture; and there appears to be no chance of any stock coming into the market, at all events until after the dividend has been paid. Among the Suburban and Provincial undertakings, there were a few dealings at good prices; and quotations were steady, except for Alliance, which fell, but without business done. In Continentals there was a little drop in Imperial; but the rest were firm. Other undertakings were not conspicuous. More business was done in Water stocks; and changes in quotation brought lower prices.

The daily operations were: Monday opened quietly in Gas stocks generally, except South Metropolitan, which was more freely dealt in. It showed a fall of 1½; and Gaslight "A" dropped 1. Tuesday's business was very similar. Gaslight "A" fell 2; and South Metropolitan, 4½. East London Water was 2 lower. Wednesday was a very flat day. Gaslight "A" receded 3; Imperial Continental, 2; and South Metropolitan, 5 (with business marked at 140). Thursday's transactions were still nearly all in the big issues; and Gaslight "A" fell 1. In Water, East London and Grand Junction showed a decline of 2; and Kent new, 3. Friday was a quieter day; but movements were still adverse. Alliance fell 2; Gaslight "A" and Imperial Continental, 1; and Belgrano, ¼. Saturday was much steadier; and there was no further drop.

LEONARD GEORGE DRORY.

We regret to announce the death, on the 9th inst., after a brief illness, of Mr. Leonard George Drory, who for nearly 54 years was in the service of the Imperial Continental Gas Association. On the Monday previous to his death, he was on the Rhine with his daughter, when, becoming unwell, he requested that he might be at once taken back to Berlin. This was done; and the doctors who saw him on his arrival were of opinion that there was no immediate danger. On the following Wednesday, however, while talking with his brother Edward, the present Manager of the Berlin station, about the alterations already carried out on the works, and making suggestions with regard to future improvements, he suddenly expired. Deceased entered the service of the Association at the age of nineteen, as pupil engineer at Ghent, in October, 1842; and he was appointed Assistant-Engineer at Berlin in 1845. In 1855 he was raised to the position of Engineer in charge of the station at Rotterdam; in 1856, he had the supervision of that at Cologne; and in 1858, of that at Toulouse. In 1860, he again took up the duties of Assistant-Engineer at Berlin. He returned to Toulouse as Chief Engineer in 1862; and two years later he was re-appointed Assistant-Engineer at Berlin, where he was Chief Engineer in 1866. In 1878 he was appointed, in addition, Inspecting Engineer of the Association's stations. He relinquished this position in December, 1891, but retained his post at Berlin; and this he only resigned in June last. After so long a connection with the Association, it is only natural that Mr. Drory should have felt special attachment to their works. He frequently expressed a

wish that he might be upon them when his life closed; and, as events turned out, it was gratified. The funeral took place at the Luisenstadt Churchyard on the 12th inst.; the coffin (which could not be seen owing to the large number of wreaths with which it was covered) being followed by the technical and clerical staff of the Association at Berlin, by engineers from other towns, and by about 600 of the workmen. The Board of Directors were represented by the Secretary (Mr. R. W. Wilson).

THE INSTITUTION OF GAS ENGINEERS IN GLASGOW.

This year's autumn meeting of the Institution of Gas Engineers opened in Glasgow on Thursday last, under the presidency of Mr. William Foulis, Engineer to the Glasgow Corporation Gas Committee. Every care had been taken, as our columns will testify, to keep this fixture before the minds of members of the Institution; and, as a result, a very fair number responded by their presence to the invitation of the Lord Provost and Convener of the Glasgow Committee on Gas and Electric Lighting. Unfortunately, the weather was anything but favourable to the comfortable carrying out of the very full programme that had been arranged for the first day of the meeting; and it was under lowering skies, that soon discharged themselves in a heavy and persistent downpour of rain, that the visitors repaired to the *rendezvous* at the Municipal Buildings. Here they were received by ex-Bailie R. M. Mitchell, the Convener of the Gas Committee, in the enforced absence of the Lord Provost; and hence a departure was made—after an exchange of brief complimentary speeches between ex-Bailie Mitchell, representing the Corporation and the Gas Committee, and Mr. Corbet Woodall, for the Institution—for the Tradeston station.

According to a statement that had been specially prepared for the occasion, gas-works were first established on this site in the year 1838; but in 1869 the manufacturing capacity of the station was only 1½ million cubic feet of gas per day. By the year 1888 this had been increased to an output of 4½ million cubic feet per day; but the district supplied by the station continued to grow so rapidly, that it was then found necessary to reconstruct the station entirely. In order to carry this out so as to largely augment the productive power of the works, additional ground was acquired on the other side of the railway then bounding the station; it was also necessary to shut up and utilize the site of a street separating the two portions of ground, and connect them by bridges across the railway—the main line of the Caledonian Railway Company—and practically to rebuild everything from the ground. This extensive and troublesome work of reconstruction is now being completed; and the station, when finished, will have a manufacturing capacity of 10 million cubic feet per day. A ground plan of the old and the new works was supplied to the visitors, by reference to which the scheme of reconstruction could be followed. The largest portion of the old site is occupied by a stage retort-house in four divisions, ranged side by side, each containing 272 retorts in benches of eight, with coal-store at one end. The settings are fired by means of gas-furnaces, upon Mr. Foulis's system; and three-hour charges are the rule. The retorts are single, for convenience of working, placed end to end; and the coke as drawn falls into the waggons in the vault below, whence it is drawn out red hot by Mr. Foulis's busy little locomotives. From the quenching-ground where it is tipped sideways out of these waggons, the coke is picked up by a "grab" crane working on a gantry, and deposited in railway trucks. Plain vertical pipe condensers are used, with a set of Messrs. Walker's washer-scrubbers. All the buildings and the mechanical equipment of the station are substantial, neat, and very workmanlike in appearance. A new three-lift holder to contain 5 million cubic feet of gas, is being constructed by Messrs. Clayton on the new ground. It is 220 feet in diameter, with sides 45 feet deep, all in steel throughout, including the lattice-work guide-framing; a feature of the holder being the absence of vertical riveted seams in the sides—the sheets, 3 feet wide, extending from one vertical stay to another. It is a strong-looking piece of work, calculated to give satisfaction to all concerned with its erection.

Leaving the Tradeston Gas-Works, the party was conducted to the splendid establishment of the Fairfield Shipbuilding and Engineering Company, which is a supreme embodiment of the genius and capacity for this class of enterprise, that has done so much for the Clyde region. Sir William Arrol, who is a Director of the Company, was present to receive and conduct the visitors over these great works, which cannot possibly be adequately characterized, to say nothing of being described, in these columns. Suffice it to say that this visit of inspection was a revelation of what is possible, in the joint lines of shipbuilding and marine engineering construction, to a private firm having the command of pre-eminent mechanical skill, administrative capacity that foresees everything and overlooks no point of detail, as well as apparently unlimited resources.

The Fairfield visit was an interlude. A return to gas engineering was effected when the party reached the Dawsholm station of the Corporation Gas Committee. It is hardly necessary to describe in detail these works, which have several times occupied our attention. As at Tradeston, the carbonizing plant here has been systematized for very effective gas firing, coke delivery, and retort charging and drawing by machinery. All this is perfect, and the arrangements appear to work like a charm. As, however, there is always something new to be seen in every gas-works managed by a progressive engineer, so at Dawsholm the visitors on Thursday—thoroughly drenched and bedrabbled as they were by the time of their arrival at this stage of their progress—forgot their dampness in their curiosity respecting the nature and results of Mr. Foulis's oil-gas enrichment and cyanogen-recovery processes.

The first is an attempt—how far successful it is not for us to say—to realize a higher carburetting duty from oil than is possible by any other method capable of extensive application. In order to effect this, a pair of lofty vertical gas generators—originally carburetted water-gas plant, in fact—are fitted each with a central iron retort consisting of a 36-inch gas main-pipe. The heat is supplied by a separate gas-producer. Into the first of these vertical retorts is sprayed, under pressure, the oil intended to be used for carburetting, at the rate (say) of 45 gallons per hour. The temperature is maintained at about 1110° Fahr., which is sufficient to completely vaporize the oil-spray formed in the manner indicated; no residuum being left in the retort under the normal conditions of temperature and rate of flow. The next retort gasifies this vapour, and for this purpose a higher temperature—1240° Fahr.—is required. The result is an oil gas of about 106-candle power on the enrichment basis, which is immediately mixed with sufficient of the coal gas made at the station to produce a gas of 40-candle power, and this is used in practical enriching.

The second novelty of the Dawsholm works is the cyanide plant, by which Mr. Foulis recovers a notable proportion of this hitherto neglected bye-product of coal carbonization in the marketable form of ferrocyanide. This is effected by washing the gas, previously freed from ammonia, in a specially prepared solution of chloride of iron, rendered alkaline with soda. The process is apparently quite successful, after having occupied Mr. Foulis's study during the last three years. After Dawsholm, a visit of inspection to Sir William Arrol's works was on the programme. But the weather was too bad to encourage many of the party to keep longer outdoors; and so an early return to quarters for dry clothing was the more general move.

In the evening, the members, together with a number of the Gas Committee, were entertained to dinner within the City Chambers by the Lord Provost and the Convener of the Committee. The utmost hospitality and geniality marked this function, which formed an enjoyable close to a hard day of sight-seeing under the most depressing conditions. Next day was well filled with an excursion down the Clyde.

PERSONAL.

Mr. E. Sandeman, the Water Engineer to the Plymouth Corporation, was recently presented by the Water Committee with a silver tea-service as a wedding gift.

Mr. W. Townshend Batten, late Manager of the Singapore Gas Company, Limited, and now a Director of the Company, has been unanimously elected Deputy-Chairman by the Board.

We regret to learn that Mr. H. Hallett has been obliged, through ill health, to resign his position as representing Messrs. Arden Hill and Co. in London and the South of England, and is sailing early next month for Australia and New Zealand. Mr. Hallett is well known to most of the gas engineers in the districts over which he travelled, and was in many quarters a very popular man.

After the spring meeting of the Institution of Gas Engineers, Mr. Thomas Cole, the Secretary, was obliged to leave England for a long sea voyage, on account of the delicate state of health of his son. Members of the Institution were gratified to learn last week that Mr. Cole had reached Sydney, and (with his son) was in good health. Mr. Cole's routine duties in Glasgow, in connection with the proceedings noticed elsewhere to-day, were discharged by his assistant, Mr. Giles.

An interesting presentation was made last Friday, at the works of Messrs. Richmond and Co., Limited, at Warrington, to Mr. H. E. Ransome, the Manager, on the occasion of his marriage. Mr. E. W. T. Richmond, the Managing-Director, who presided, referred in appreciative terms to the great ability displayed by Mr. Ransome, which had enabled him in five years to attain the position he then held. He expressed his sincere pleasure in presenting a piano, music-stool, cabinet, and over-mantel to Mr. and Mrs. Ransome, on behalf of the Directors, employees, and friends of the Company. Mr. Ransome suitably acknowledged the gifts for himself and Mrs. Ransome; and the latter briefly expressed her gratitude for the good wishes conveyed with them.

Incandescent Gas Lighting in Berlin.—It may interest some readers of the "Journal" to learn that the city authorities of Berlin have given an order to the Welsbach Company there for the installation of the incandescent gas-light in the streets off the Friedrichstrasse, as well as in the whole of the Hansa quarter. For some time the light has been experimentally tried in different parts of the city. These installations have been taken over by the town, and it is anticipated that the system will now be largely adopted.

NOTES.

The Removal of Naphthalene from Gasholder Mains.

Herr O. Peischer, of Bozen, writes to the "Journal für Gasbeleuchtung" to describe a method he has found successful for the removal of naphthalene from the inlet and outlet mains of small holders. He makes two holes in the gasholder crown immediately above these mains, sufficiently large to admit of the introduction of a ½-inch pipe. A wrought-iron pipe of this diameter is plugged at the lower end; and some small holes bored in it near that point. The upper end is furnished with a tap and funnel. When naphthalene is found to have accumulated in the inlet or outlet main, the pipe is introduced through the crown, boiling water is poured into the funnel, and the main is sprayed by it. The action is rapid; and in a quarter of an hour, the obstruction will have completely disappeared. Of course, its re-appearance is not prevented; but the remedy is simple, and may be applied as often as needed. A screw-plug is inserted in the hole in the crown when the pipe is not in position.

Sulphides in Calcium Carbide.

Mr. F. J. Pope has lately communicated to the American Chemical Society the following interesting preliminary suggestions for the estimation of sulphides contained in carbide of calcium: A weighed quantity of the carbide is conveyed to a dry Erlenmeyer flask provided with a stopcock funnel and a delivery-tube. The latter leads to a 10-oz. wash-bottle which in turn is connected with a smaller one. The wash-bottles contain 150 c.c. of lead acetate of known strength (about 1-10th normal). By means of a stopcock, water is carefully added until there is no further evolution of acetylene. On the reaction ceasing, 25 to 40 c.c. sulphuric acid (1 : 3) is run into the flask, and the whole gently boiled; the liberated hydrogen sulphide passing into the wash-bottles, and precipitating the lead as lead sulphide. When the reaction has ceased, the flask and liquid are washed free of hydrogen sulphide by a current of air, and the contents of the wash-bottles filtered. The filtrate containing unconsumed lead acetate is made up to half a litre. To 100 c.c. of this solution, standard potassium bichromate, arsenious acid, &c., are added, and the total amount of unconsumed lead acetate estimated. The difference between this amount and the quantity of lead acetate started with, gives the amount precipitated by the sulphuretted hydrogen, from which the sulphur existing as sulphide can be calculated. In two experiments, 3·37 and 3·57 per cent. of sulphur were found on the two respective quantities of 2·4492 and 3·1234 grammes taken. The method has not been checked; and the carbide may evolve other products which remove lead from the solution. The author, however, purposes investigating this and other points bearing on the reliability of the method.

The Determination of Ash in Coke.

Herr R. Helmhacker gives in the "Engineering and Mining Journal" an interesting recapitulation of the methods that have been proposed for determining carbon or ash in graphite and coke. The usual method is to heat a sample in a platinum crucible until the carbon is completely burnt off; but this is very tedious. The coke may be weighed in a platinum boat, and burnt in a stream of oxygen in a refractory tube; and either the residual ash or the carbonic acid produced is then weighed This is much more rapid than the simple combustion process. Stolba has, however, greatly improved on the old method. He mixes the coke with half its weight of finely divided metallic silver in a platinum crucible, which is then carefully raised to a red heat, while the contents are from time to time gently stirred with a platinum wire. The combustion is finished in from half-an-hour to one hour. The action of the silver in facilitating the combustion is said to be due to the oxygen condensed among its particles. It is well known that molten silver absorbs oxygen from the air. Berthier proposed to determine the heating value of a fuel by the reducing action of its carbon on lead oxide, when the two were heated together in a porcelain crucible.

The Rate of Evaporation from Earth and Water.

The problem of the amount of evaporation that may be reckoned upon as characterizing a given area of country is one of cardinal importance in connection with some water-supply problems; yet, as discussed by Professor Cleveland Abbe, in the United States "Monthly Weather Review," it is a matter that is only very imperfectly known. So uncertain are the indications of instruments constructed to give data of natural evaporation, that it seems almost hopeless to attempt anything like an accurate determination of the moisture actually added to the atmosphere by evaporation from any extensive area of land or water. Such a question is far more complex than the determination of the evaporation from a reservoir of water, which is often attempted by engineers. Including the earth and its atmosphere in one comprehensive view, we may certainly say that the total annual evaporation from snow and ice, fresh water and salt water, must average the same as the total annual precipitation. We may even make an annual average for a continent, and say that the evaporation from the land *plus* the water that flows away in the rivers must equal the rainfall; and as the river discharge may be known, it is possible, by subtraction, to infer the evaporation. The latest contribution to our knowledge of evaporation from land surfaces is due to the labours of Professor E. Wollny, of Munich. This is that the quantity of moisture evaporated from the soil into the atmosphere is considerably smaller than that evaporated from a free surface of water; that the evaporation is smallest from naked sand, and largest from naked clay, whereas naked turf or vegetable mould has a medium value; and that the evaporation is increased to a considerable extent by covering the ground with living plants. As the result of a minute examination and analysis of the complex relations between the evaporation and the meteorological elements on the one hand, and the physical features of the soil on the other, Dr. Wollny further concludes that evaporation is affected by the quantity of moisture contained in the substratum of soil. Among the external circumstances, temperature is of the greatest importance, inasmuch as, in general, evaporation increases and diminishes with it, subject to certain modifying considerations. Other observations are made, upon which Professor Abbe concludes that they confirm the opinion commonly held, that the quantity of water actually evaporated from a large surface of land, such as a definite watershed maintaining a single river, can only be ascertained as a difference between the total rainfall and the quantities accounted for by other losses and drainage.

The Solubility of Lead in Water.

Three series of experiments on the amount of lead taken up by water in prolonged contact with it, have been carried out by two Italian chemists, Signori U. Antony and T. Benelli. The first series was made with pure distilled water; the second with water containing a little common salt; and the third with water containing a small quantity of sodium sulphate. In each series, experiments were made (1) with water deprived by boiling of its naturally contained air; (2) with water after brisk agitation with air; (3) with water through which a continuous stream of air, filtered through cotton wool, was passed; and (4) with water through which air to which two-fifths of its volume of carbon dioxide had been added was passed. In each test, 150 c.c. of the water was in contact for five days with a spiral of lead wire having a surface of 44 square inches. The metal was attacked in every instance; but the degree of erosion did not always correspond with the amount of lead taken into solution. The solubility was greatest in the pure water which had been agitated with air, and was always greater in the pure water than in the saline solutions. The water through which the mixture of air and carbon dioxide was passed dissolved the least lead, though the spiral was strongly attacked. It must therefore be assumed that little soluble lead hydroxide was formed in this case. The chloride diminished the solubility of the lead more than the sulphate. The quantities of lead found ranged from 0·68 to 12·98 per cent. of the weight of the water used in each experiment.

Paper Gas-Mains.—"Dingler's Polytechnisches Journal" has described gas-pipes made by winding thick paper or cellulose round a solid core. Between each turn a layer of molten asphalte is laid on; and the pipe is thus made impervious to air and water. The pipes are joined by means of paper sockets and asphalte. They are stated to be light, not liable to fracture, cheap, and durable.

A New Burnishing Fluid.—The following composition is recommended at the chemical laboratory of the Bavarian Industrial Museum for cleansing and burnishing iron and steel engine parts: 15 parts of turpentine oil, 25 parts of stearine oil, 25 parts of finely-ground rouge, and 45 parts of finely-divided animal charcoal, mixed to a paste, and then brought to a thin liquid by the addition of spirit.

The Projected Gas Exhibition in New York.—The prospectus of the gas exhibition which it is intended to hold in Madison Square Garden, New York, during the two weeks commencing Jan. 25, 1897, has been issued. We have already stated that the project is to be carried out under the auspices of the Gas Industries Company, No. 280, Broadway, New York, which has been formed for the purpose. The Board of Directors of the Company is thoroughly representative; and though the President has not yet been selected, they have in view a highly popular gentleman who no doubt will accept the position. The Executive Committee consists of Mr. E. C. Brown, the Editor of "Progressive Age" and the Managing-Director of the Company (Chairman), Mr. Emerson M'Millin, Col. W. E. Barrows, Mr. W. H. Bradley, and Mr. Walton Clark. The object of the exhibition, as set forth in the prospectus, is "to bring together a collection of gas apparatus and appliances of every description, for the twofold purpose of affording the general public and the gas engineer an opportunity to study the developments that have taken place in the gas industry during recent years." The area available will be divided into fifteen blocks, with, in addition, a promenade situated 12 feet above the main floor. There will be 262 spaces, from 49 to 64 feet superficial area, which will be let at prices varying according to position. Near the amphitheatre in which the exhibits will be displayed, there is a large lecture and concert hall, in which demonstrations in cookery will be given by the most experienced ladies obtainable. It is hoped to make these lectures one of the most attractive features of the undertaking. The Michigan, Ohio, Pacific Coast, and Western Gas Associations have appointed representatives at the exhibition.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Sixteenth Half-Yearly Meeting of the above Association was held last Wednesday, at East Retford. The attendance of members was not quite up to the average; but, including friends from kindred Associations and other visitors, there was a good muster. The day's programme commenced with a visit to the Corporation Gas-Works, where the company were received by the Mayor (Alderman Beardsall), the Chairman of the Gas Committee (Alderman Tomlinson), and the Gas and Water Works Engineer (Mr. J. B. Fenwick). The works were found to be the picture of neatness, and replete with everything necessary to ensure, in the capable hands of the Manager, excellent results. Mr. Fenwick is to be heartily congratulated upon having a Gas Committee who exercise an intelligent interest in maintaining the works, and who, it is plainly manifest from the surroundings of the works, have been anything but niggardly in making provision for the comfort of their Manager.

Leaving the gas-works, the visitors proceeded to the White Hart Hotel, where, thanks to the generosity of the Gas Committee, an ample luncheon awaited them. Subsequently, and without loss of time, they passed across the spacious Market Place to the Town Hall, where, at 2.30, Mr. ARTHUR DRAGE, of East Dereham (the President for the year), took the chair.

AN OFFICIAL RECEPTION.

The MAYOR, at once rising, said that, as Mayor of the town, and also as a member of the Gas Committee, he tendered the members of the Association a hearty welcome to Retford. He looked upon their visit as a great compliment to the town, and also to their Gas and Water Manager. He was sure the Corporation had a good Manager in Mr. Fenwick; and this the members would have seen for themselves, by the condition of the gas-works, which they had had an opportunity of inspecting that morning. He expressed the hope that the meeting would be the means of benefiting the great industry which the members represented. He felt confident that nothing would further the interests of gas undertakings better than such meetings as these, where managers could interchange the varied experiences which they gained in their calling.

The PRESIDENT heartily thanked his Worship for the cordial welcome he had extended to the Association.

MINUTES OF LAST MEETING.

The HON. SECRETARY (Mr. J. H. Troughton, of Newmarket) read the minutes of the meeting held at East Dereham on April 15 last; and they were confirmed.

NEW MEMBERS.

Mr. Arthur Graham, of Mansfield, and Mr. Robert Bridge, of Doncaster, were next elected members of the Association.

A FIXTURE FOR THE SPRING MEETINGS.

Mr. J. T. JOLLIFFE (Ipswich) said it struck him some time ago that their meetings were not attended quite so well as they had hoped they would be; and the causes appeared to him to be the scattered district they represented, and the difficulty that occurred with many members on account of the distance and inaccessibility of the places chosen for the meetings. He thought this difficulty might be overcome, at all events for one meeting in the year, if they decided to meet in a central town in the district. His own opinion was that Bury St. Edmunds was perhaps the most central. But it was not quite so accessible as Cambridge; and the Committee considered that Cambridge was the better place. He therefore proposed that future spring meetings be held there.

Mr. W. D. CHILD (Romford) seconded the motion. As a member of the Committee who discussed this question, he likewise thought it desirable that the spring meetings should be so arranged as to be suited to the convenience of the bulk of the members.

Mr. R. G. SHADBOLT (Grantham) said he should not have risen, but the matter was one that affected the future; and he hoped to be able to attend the meetings of the Association for some considerable number of years. Consequently, he felt interested in the place at which the meetings were to be held. When he received the circular on the subject which had been sent to the members, it struck him that Cambridge was not altogether the most central town; and, with the view of deciding the point, he took a map and a list of the members, and found that, if they excepted Tonbridge, Cambridge was about as central for the district approaching it from a southerly point as Lincoln was approaching it from a northerly one. The district was not circular. If they drew a line from east to west through Cambridge, he found they had now 39 members to the north of Cambridge, and 18 to the south. Taking Peterborough as a hap-hazard centre, he found they had 28 members north of Peterborough and 30 members to the south. Therefore, in his judgment, Peterborough was more central for the district. It was on the Great Northern Railway, and also very accessible for members on the Great Eastern line. Looking at the *personnel* of the Committee, he saw that most of the gentlemen were southern members; and it was only natural they should strike on a place like Cambridge as being the handiest to get at. He would move, as an amendment, that Peterborough be selected for the spring meetings.

Mr. E. J. BROCKWAY (Cleethorpes) agreed that Peterborough would be more accessible for the greater number of members; and therefore he seconded the amendment.

Mr. H. WIMHURST mentioned that, when the Committee had this matter under discussion, both Cambridge and Peterborough were considered; and it was then thought that the former would be more accessible to the greater number of members than Peterborough. But after Mr. Shadbolt's statement, he was inclined to go with him. However, he thought they might try the experiment of having the meeting at Cambridge; and if it did not work satisfactorily, after a year or two they could alter it to Peterborough. He asked members to back up the Committee in their recommendation; but, at the same time, he must say, they had no feeling in the matter as to whether the meeting was held at Cambridge or Peterborough.

Mr. JOLLIFFE said he should like to remark that personally he did not care which place was selected; and he suggested that the members should vote on the two towns. It was not a question of east or west; but a question of the convenience of the greater number of the members.

Further discussion ensued; and, in the end, the members declared in favour of Peterborough, but only a few voted.

Mr. SHADBOLT then read the following paper, entitled

THE SELF-ENRICHMENT OF COAL GAS.

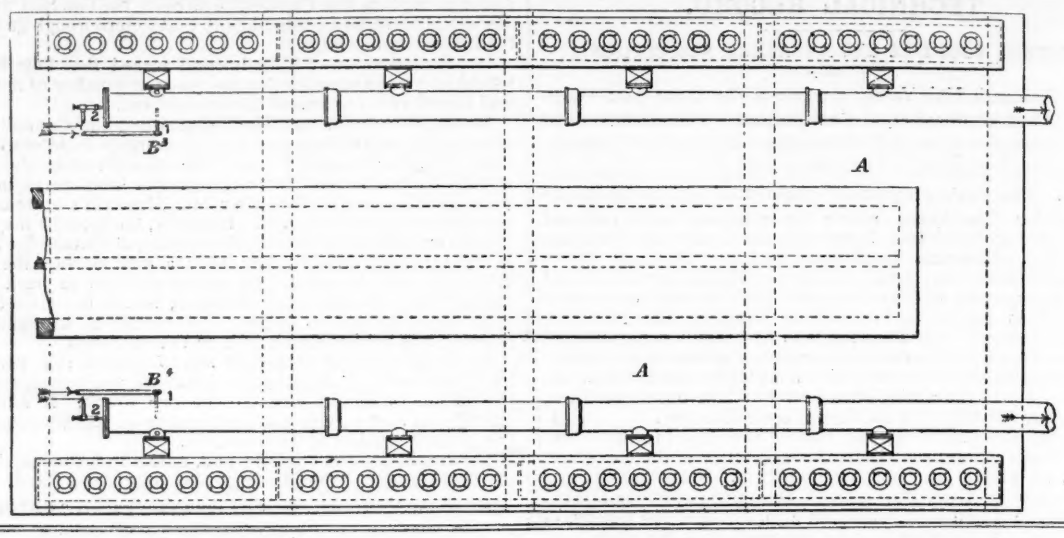
It might, at first sight, appear that such a well-worn subject as that of gas enrichment is scarcely one to command attention, or one that is likely to yield anything new or interesting. However, as like all else, the treatment of any subject must be judged on its merits, I venture to bring before your notice certain experiments, tests, &c., and deductions therefrom, which are at any rate additions to the writer's store of knowledge; and leave the verdict with you.

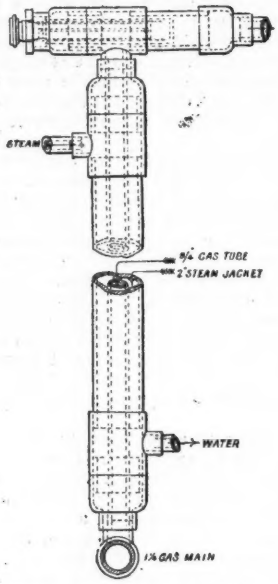
Without in any way re-opening the controversy as to whether or not enrichment in the ordinary sense is of any real advantage to either manufacturer or consumer, let it be admitted that, under present-day conditions, enrichment of one kind or another is, generally speaking, a necessity; and however unwilling we may be to acknowledge the fact, we are compelled by the force of circumstances to face the inevitable. When relating one's observations and experiences, it is often of advantage to not simply give a summary of the matters in question, but also an outline of the course of events which led to those conclusions; and, in so doing, it is most interesting at times to note how one line of experiments leads to another, and how ofttimes experiments develop in quite an opposite direction to that originally expected.

Most gas managers at some time or other would appear to dabble more or less in experimental work—thanks, in a great measure, being due to our District Associations and Institutions—and in the present case, as in many others, it was while following this bent, and experimenting in a certain direction (though with a view to attaining a similar end), that another line of experiments suggested itself, which has culminated in what I have the honour to place before you to-day. It is now some two years since the foregoing set of experiments were commenced. Like many another, the writer has been under the spell of gas enrichment by means of coal tar; and it was really while pursuing this will-o'-the-wisp that the idea leading to the present conclusions was conceived.

Without going into details of attempts at tar enrichment, which have no direct interest for us at present, suffice it to say that at this time clouds of heavy tar gas and vapour—but principally the latter—were entering the hydraulic main, and there intermingling with the foul coal gases from the retorts. Such a body of heavy vapours, as can readily be understood, was almost certain to condense out, thereby undoing all that was being attempted; and while cogitating as to the best method of preventing this, the thought occured that, if a portion of purified gas was returned into either the foul or hydraulic main, the whole becoming to some extent diluted—or, to speak more scientifically, thereby altering the vapour tension—the enriching vapours might be more easily carried, and subsequently fixed. Before, however, anything further was attempted, the fates decreed that a short interval should elapse, which gave one due time for reflection. Reflection carried one a step farther, for, provided returning a portion of the purified gas did in practice assist to carry forward hydrocarbon vapours which would otherwise condense out, it was simple logic to conclude that the same process would attain the desired end by preventing the precipitation of the vapours contained in the ordinary foul gas; and as simplicity is a desideratum, and prevention universally recognized as being better than cure, preparations were made, as soon as convenient, to put this notion to a practical test.

For the sake of clearness, it will perhaps be better to divide the treatment of the returning gas into two separate heads—viz., from whence returned, and the point returned to. Dealing, then, with the latter first, it was deemed advisable to intermingle the crude and returning gases at as early a stage as possible—having due regard to convenience—and also to provide the returning-gas tubes with steam-jackets or other equivalents immediately prior to the introduction of the returning gas into the foul main; the object being the approximation of its temperature





to that of the crude coal gas. Having regard to all the circumstances of the case, the point fixed upon for the introduction of the returning gas, was that directly opposite the hydraulic main outlet; and in order that the admixture should be the more completely effected, the returning gas was conducted halfway across the foul main, as shown in sketch No. 1, thereby impinging upon the centre of the stream of gas issuing from the valve. As seen by the sketch, the bench consisted of four through beds of retorts; and the fittings and connections for conducting the returning gas were alike on both sides. As previously mentioned, the other point to determine was that from whence the returning gas should be drawn. The idea was to return thoroughly purified gas; but as this would undoubtedly mean increased back-pressure on the purifiers in winter time, it was decided to tap the inlet side of the purifiers, and connections were accordingly made with the outlet of the second scrubber—the scrubbers immediately preceding the purifiers. A 200-light wet meter was pressed into the service; and taking advantage of the difference in pressures at the two points, any quantity of gas might be returned up to the maximum capacity of the meter.

Now all was in readiness, and a commencement duly made. The illuminating power of the gas at this time was about 16¾ candles; but after returning it at the rate of from 12 to 15 per cent. of the make for 24 hours or so, a distinct improvement in the illuminating power of the gas was noticeable. This improvement continued gradually to increase until 19¼-candle power had been reached, and was upheld for some three or four days. Just at this critical and interesting point, changing conditions—the sworn enemy to the experimentally inclined—interfered; and gradually, in spite of all efforts to prevent it, the illuminating power fell to 18 candles, and later on to 17¾ candles. Needless to say, such results were extremely tantalizing; and they may perhaps be the better understood if a brief *resumé* of the conditions be given. A moment's reference to sketch No. 1 will assist in this.

The retort-stack as here shown has a separate hydraulic main to each single or half bed, likewise a separate valve and connection with the foul main. The three single beds, or through bed and a half (each half bed was workable as a single) marked A were at this time under fire; and it became necessary, on account of insufficient storage and for repairs, to light up and work the through bed marked B in their stead—in fact, knowing this transfer would be shortly made was the reason for connecting the returning-gas tubes at point 1, as shown. Now it was while the beds A were working and beds B being prepared, that the maximum illuminating power of 19¼ candles—being an addition of 2½ candles—was reached; but after transferring gas-making operations to beds B, 17½ candles, or an addition of only ¾ candle, was the greatest increase obtainable.

Having once secured an increase of 2½ candles, one did not relish giving up the game, and at the first rebuff, too. In fact, it simply served to whet the appetite. But how to account for this sudden fall in illuminating power was the problem—and a puzzling one withal. One consolation was left—viz., that although the results had diminished so considerably, still some improvement remained; but this was very erratic, coming and going in a most unaccountable fashion, the nice adjustment of temperatures notwithstanding. Upon consideration, it seemed just possible that the friction caused by the stream of returning gas impinging upon that of the foul gas, might precipitate condensation to some extent, and in consequence bring about the loss of some of those vapours it was so desirous to retain. An attempt was therefore made to secure conditions as nearly approaching those previously existing as possible, by changing the point at which the returning gas entered the foul main from 1 to 2—thus allowing the gases to intermingle more gradually; but although a candle (and on one occasion as much as 1½ candles) increased illuminating power was obtained, it was still very uncertain in its action, and quite uncontrolable.

Having pretty well exhausted one's resources at the foul main end, attention was again turned, by way of change, to the opposite, or point from whence the returning gases were drawn, as previously noted, from the clean scrubber outlet. The thought suggested itself that possibly the original idea of returning thoroughly purified gas had not been sufficiently adhered to; and varying proportions of remaining impurities contained in the gas after its passage through the scrubbers might, to some extent, account for the fluctuations in enriching results. With a view of once and for all setting this matter at rest, gas was returned from the station meter inlet; but here, as elsewhere, the unexpected happened, for instead of steadying the fluctuating results previously obtained, they were lost entirely, and replaced by a slight actual decrease in illuminating power. This was taken as the danger signal; and a halt was accordingly made.

Here was something which had actually been in one's possession; and just at the time when the greatest hope and expectations had been inspired, it disappeared as by magic. There are times when one becomes desperate. A determination, born almost of despair, was formed that, whatever the result, a searching investigation of all available ground should be made. Hence, after being summarily put to the rightabout, measures were adopted for returning gas from every available point between the exhauster and station meter. The before-mentioned 200-light wet meter was so connected that gas could be passed through it from either the first scrubber, second scrubber, purifiers, or station meter inlets, and be readily changed from any one to another.

Commencing at the station meter inlet, and systematically working backwards towards the exhauster, gradually improving results were obtained until, when returning gas in the proportion of about 8 per cent. of the make from the second scrubber inlet, results almost identical with those in the first instance were obtained. But again history repeated itself almost to an

hour; and after a few days of from 19 to 19½ candle gas, the illuminating power again declined to about 17½ candles, playing the same pranks as before, and fluctuating in a most perplexing fashion. Having satisfied myself that approximately the right point had been determined from which to draw the returning gas, the opposite or foul end became again the subject of attention. This time thermometers were requisitioned; being placed respectively in the streams of foul gas issuing from the hydraulic mains, and that returning from the scrubber just prior to its entering the foul mains. Hourly observations of the temperatures at these two points were made, with a view to bringing them exactly alike; and, as a result, the root of the whole matter was discovered.

As previously stated, the returning-gas tubes were passed through steam-jackets at the foul main end; and hitherto sufficient steam had been circulated to raise the temperature of the returning gas approximately to that in the foul main—being judged by the sensible heat to the hand. The first thing noticeable after fixing the thermometers, was that the temperature of the foul gases varied tremendously; running up at times as high as 180° to 190° Fahr., and at others, under apparently identical conditions, dropping as low as 110° Fahr. and under. One could readily understand a great difference in the temperatures of gases given off at various parts of the six hours (that being the duration of each charge); but this great difference was observed when comparing different charges at the same stage. Further observations went to show that when both beds of retorts were charged at the same time by coal from the same truck, and the heats were as near alike as it is possible to get them, the same unaccountable difference in the temperatures existed between the gases issuing from these two beds as had been previously noted when comparing different charges at similar stages in one bed only. Not only so, but whereas on one occasion the gas from (say) bed B3 would be 30° or 40° Fahr. higher than that from B4, at another time exactly the reverse would be found. At times this difference would remain fairly constant for a whole day, and at others would change backward and forward several times during a day. On some days the mean temperature of the gas from the two beds would be considerably higher than on others, and, of course, *vice versa*. This latter variation was doubtless due to atmospheric conditions, as the retort-house was well ventilated; but the former differences cannot be accounted for so easily—indeed, the writer has so far made no further attempt to solve the problem. The principal interest centred in the fact that great variations in temperature did take place, and such as might account for the eccentricities hitherto experienced.

Now matters were coming rapidly to a head; for upon further observation, the variations in temperature of the foul gas were found to be practically identical with those of the illuminating power of the purified gas, and the best enriching results were obtained when the mean temperature of the foul gas was at its lowest. Here, then, was the matter in a nutshell. When the gas was produced in beds A, a lower temperature would reign in the foul main at the hydraulic outlet than when beds B were used, because A end of the stack was subject to much freer ventilation than the other; and one can only regret that actual temperatures were not taken at the time. However, definite knowledge had been acquired; and all that now remained was to put this knowledge to a practical test. At this stage, further tests became impossible for a time, owing to the writer's removal to another sphere of action.

Change of scene may have many advantages; but, generally speaking, along with these go hand-in-hand a fair proportion of disadvantages—possibly as a kind of counteracting agency. One of these disadvantages in the present case was the compulsory breaking off of tests of such an interesting character, and at such an interesting stage. However, although the removal of the writer to Grantham necessitated, in a sense, a fresh start, it was a start of an entirely different nature; for whereas at the commencement of the Low Moor experiment speculation was the principal stock-in-trade, at Grantham actual knowledge—the result of the former experiments—formed the basis of all operations. As has been pointed out, the problem had practically been solved, so that any further deviations would be simply of a modifiable character. The apparent disadvantage of a suspension of tests soon proved to be a real advantage, for no two sets of conditions could well be more diverse than those of Low Moor and Grantham. The only real loss was that of time (in itself a most valuable thing), which, in the present instance, served to mark a stage—the transition from the purely experimental to what one might term corroborative tests, the value of which was of necessity greatly enhanced when carried out under these altered conditions.

Tests of this kind cannot be resumed under such altered conditions at once, however desirous one may be to do so. Many things transpire for the first few months to monopolize the attention; and even when these are overcome, plant and instruments may require some slight alteration and modification. Take, for instance, the present case, where some relics only could be discovered of what had evidently at one time served as a photometer, but which were such as to be quite useless in their original capacity. This and other considerations conspired to cause considerable delay—in fact, it was not until the beginning of this year that the corroborative set of experiments actually commenced.

Before proceeding further, it will, perhaps, be advisable to give roughly some idea of the different conditions existing at the two works—viz., Low Moor and Grantham. So far as we are at present concerned, the condensing, scrubbing, and washing plant are all that need be compared; and this will best be done by stating their respective capacities:—

Works.	Condensers. Superficial Area.	Scrubbers. Cubical Contents.	Livesey Washer. Capacity per Diem.
Low Moor	10,000 ft.	7200 ft.	—
Grantham	920 ,,	1800 ,,	¾ million *

* Recently erected.

Without giving exact figures, the maximum daily make of gas may be taken as 450,000 cubic feet in each case; so that the widely differing conditions will be readily appreciated.

Before commencing the enriching tests proper, it was deemed at least interesting to corroborate, or otherwise, the deteriorating effects of returning thoroughly purified gas. Briefly stated, the illuminating power of the gas was found to fall slightly under these conditions. Another side issue, however, made itself apparent—viz., the life of the purifier charges was materially extended thereby.

To return for the moment to the temperature observations made at Low Moor, the conclusion then arrived at was that the fluctuations of the temperature of the foul gas issuing from the hydraulic mains were too great to give constant results. Consequently a point must be determined nearer the condensers, where the temperature would be more constant and the mean somewhat lower; for the best results were obtained at the lower temperatures. This point was found immediately preceding the condenser inlet; and the most suitable point from which to convey the returning gas was found at the outlet of the washer recently erected, between the exhauster and scrubbers.

With everything arranged in accordance with previous experience, a commencement was made; the illuminating power of the gas going up within 30 hours from 15·75 to 17·89 candles. But before registering observations of any kind, the process was used at its full for about ten days, lest there should be any increased luminosity due to liquid or solid deposits then existing. That the observations might be of a most thorough and representative character, each alteration made in the proportion of returned gas, or in conditions of any kind, was continued for at least a week, and, where any doubt or uncertainty existed, for a fortnight. With the exception of three weeks' stoppage for coal testing, the test extended over five months, and comprised three distinct sets of tests. Each set consisted of ascertaining: First, the average illuminating power of the gas without the enriching process; then with the process on at full; and gradually tapering down again to the starting-point. Each set of experiments lasted about six weeks.

The average summary of the five months' tests is as follows ("proportion" meaning the proportion of returned gas to the total quantity made thus—Proportion "A" being the lowest or minimum, and "E" the highest or maximum):—

Enriching Results.

		Candles (Average).
Without enricher	Illuminating power =	16·04
With enricher proportion A.	,, =	16·42
,, ,, ,, B.	,, =	16·65
,, ,, ,, C.	,, =	17·30
,, ,, ,, D.	,, =	17·72
,, ,, ,, E.	,, =	17·78
		16·04
Highest average increase =		1·74

This shows an average maximum increase of illuminating power of 1¾ candles, though in the winter season an increase of 2 candles is obtainable. But taking the average from January to July, the results are as above; any illuminating power between the two points being quite under control. It should be stated that all the illuminating power tests were made from gas taken from the governor inlet, and when the output was at the maximum, so as to reduce misleading results to vanishing-point.

Obtaining given enriching results at the governor-inlet and maintaining the same for any given length of time, are two distinct achievements; and possibly the first thought occurring to the mind of the practical gas manager will be: "Is this enrichment of a permanent character?" At any rate, such was the mental query of the writer when obtaining his best results; and to settle the matter, 80,000 cubic feet of gas enriched by this method from 15·75 to 17·95 candles was stored in a 100,000 holder on April 27, where it remained until Aug. 5 (or at all events 60,000 feet remained in the holder; 10,000 feet having been partly lost by leakage and the rest used.) It was then run into the town; illuminating power tests being made of every 10,000 cubic feet passed. As it may be of interest, as having some bearing on the question of diffusion during storage, I give the result of each test, with the average at the end:—

Test No.	1	of first	10,000	cubic	feet	= 16·93	Candles.
,, ,,	2	of second	,,	,,	,,	= 17·18	,,
,, ,,	3	of third	,,	,,	,,	= 17·01	,,
,, ,,	4	of fourth	,,	,,	,,	= 17·02	,,
,, ,,	5	of fifth	,,	,,	,,	= 17·24	,,
,, ,,	6	of sixth	,,	,,	,,	= 17·19	,,
						6)102·57	
					Average =	17·09	

This shows a loss of 0·86 candle only after being stored for

exactly 100 days, which, I think, is a much smaller loss than that sustained by most gases.

Having discovered such a simple and easy method of enriching gas, and satisfied one's self as to its permanency and general adaptability, the question of cost naturally arises; for we cannot reasonably expect to increase the illuminating power of our gas for nothing. Evidently something is impoverished—doubtless the tar. If you remember, the returning gases were intermingled with the foul gases just before the condenser inlet; the foul and hydraulic main tars being drawn off at this point. Consequently the condenser tars only would be those affected. These were caught and measured; and they were found to be barely 1½ gallons per ton of coal carbonized. The enricher was thrown off for three weeks; and after clearing out all old tar, samples were carefully taken during the third week, sealed, and marked "A." All tar was again removed from the condensers; the enricher was applied to the extent of 1¼ candles; and tar samples were taking during the third week as before, sealed, and marked "B." These two samples were submitted to a careful commercial analysis in due course; the report of which is as under:—

Analysis and Report on two Samples of Tar, marked "A" and "B," received from Mr. R. G. Shadbolt, Gas-Works, Grantham.

Both samples of tar were thin, and of light specific gravity; being drawn from gas condensers.

SAMPLE "A."—Being the tar produced in the condensers in the process of ordinary working.

SAMPLE "B."—Being the tar produced in the condensers during the process of enrichment to the extent of 1¼ candles.

(The specific gravity of ordinary tar = 1180/1200.)

	Sample "A."		Sample "B."
Specific gravity, water = 1	1·1135	..	1·1134
Products by weight—	Per Cent.		Per Cent.
Water	1·90	..	1·74
Crude naphtha	8·10	..	7·57
Light oil	9·26	..	7·26
Creosote	25·57	..	22·00
Anthracene and heavy oils	21·48	..	19·35
Pitch	33·00	..	41·30
Loss	0·69	..	0·78
	100·00	..	100·00

The distillation was carried to the same point in each sample.

Commercially there is very little difference in the value of the two tars. There is a small but distinct difference in the percentages of the lighter oils; sample "A" being slightly richer in benzols than "B." The percentage of heavier oils is also greater in "A" sample than "B;" while the "B" sample contains a much higher proportion of pitch.

The samples dealt with were too small to permit of the determination of the quantities of pure anthracene and carbolic acid, which, however, would not materially affect the relative commercial values of these tars.

(Signed) W. R. CHESTER.

From the foregoing report—remembering that the tar analyzed represents only 15 per cent. of the total quantity made, and that consequently the differences must be divided by 6⅔ to arrive at their total effect—we may safely conclude that the loss in value is infinitesimal, and may be dismissed as a negligible quantity. In fact, greater differences than these exist between the tars produced from two different coals in the ordinary way. The only real loss may be said to be in quantity, and may perhaps be the most easily arrived at from the pitch basis.

In comparing the two analyses, we notice that the proportion of pitch contained in sample "B" is 41·30 per cent. by weight, against 33 per cent. in sample "A"; being an increase of 8·30 per cent. on the bulk, which practically represents the loss of oils, &c., due to the enrichment process, and made up as follows:—

Loss Due to Enrichment.

	Per Cent.
Crude naphtha	0·53
Light oil	2·00
Creosote	3·57
Heavy oils, &c.	2·13
Total	8·23

For all practical purposes, therefore, we may take it that the loss in quantity is equal to 8·3 per cent. of the condenser tars variously expressed below:—

8·3 p.c. of condenser tars absorbed per 1¼ candle per 10,000 c.ft. enrichment.
1·245 p.c. of total tar made " " " " " "
0·996 " " " " 1 candle " " "
0·0996 gallon of tar used " " " " " "

Cost per candle per 10,000 c.ft., tar at 25s. per ton = 0·15d.

Needless to say, such results far exceeded the author's expectations; and, indeed, it may be that some small proportion of tar deposited in the condensers when working without the enricher remained, and to some extent affected the composition of sample "B." But if this be so—and the greatest possible care was taken to prevent it—and the tar lost be double that shown, we still have the ridiculously low figure of 0·03d. per candle per 1000 feet for enriching material, which, I think, may be safely claimed as the lowest on record. In casting round for a reason for such extraordinary results, and on reference to the analysis, one is forced to the conclusion that they are due to the utilization of heavy hydrocarbons without carbonizing or cracking them up, when a great proportion go to make gas of a lower illuminating power; but be the reason what it may, the results remain.

Little more remains to be added, save sundry notes made incidentally during experiments,

1.—When working without the enricher, oil accumulates in the washer; but when the enricher is worked at full, no oil is deposited. The quantity of oil deposited varies *pro ratâ* to the extent of the enrichment.

2.—Contrary to expectations, too much gas may be returned. If a certain proportion be exceeded, the illuminating power begins to fall.

3.—Within certain limits, the temperature of the returning gas appears to be immaterial; provision only being made for slightly raising the temperature in frosty weather.

4.—The same maximum illuminating power is obtainable summer and winter—*i.e.*, the enriching effect is greatest in the winter time, when it is most needed.

5.—The flame from a given illuminating power is apparently whiter than that of the same illuminating power obtained in the usual way—and shows rather better in the jet than the bar photometer.

6.—This method of enrichment is simplicity itself, and requires no labour expenditure.

7.—It is applicable under widely differing conditions.

8.—And is perfectly under control.

Allow me to add, in conclusion, in order that misconceptions and confusion may be avoided, that this method of gas enrichment is patented, and has, in fact, been under protection since June, 1895.

Mr. JOLLIFFE said he would not rise to discuss the subject before them, because he felt it quite impossible to deal off-hand with such a comprehensive paper as this. He, however, rose to thank Mr. Shadbolt for bringing forward such an interesting question, and his experiments thereon. Just one thing that struck him in listening to the paper was this—that Mr. Shadbolt was dealing with a different kind of coal to that which many members used; and it was well known that Midland Counties coal contained a larger percentage of benzols than Newcastle coal. It occurred to him whether, if this principle was applied in works where North Country coals only were used, anything like the same results would be obtained. It was certainly very extraordinary that Mr. Shadbolt had been so fortunate as to get this wonderful—for so he might call it—increase of illuminating power in the gas from so small a loss in tar.

Mr. WIMHURST agreed with Mr. Jolliffe that this was not the class of paper they could deal with that day; and he suggested that the discussion should be postponed to the next meeting. It appeared to him the paper wanted reading and re-reading before they could discuss it in the manner it deserved. With Mr. Jolliffe, he thanked Mr. Shadbolt most heartily for bringing the paper forward.

The PRESIDENT intimated that Mr. Shadbolt was quite willing that the discussion should be postponed.

Mr. CHILD desired to ask one question. Almost at the end of Mr. Shadbolt's paper, he said that, when working without the enricher, oil accumulated in the washer; but when the enricher was worked at full, no oil was deposited. The quantity of oil deposited varied *pro ratâ* to the extent of the enrichment. Would Mr. Shadbolt give them some idea of the character of the oil he mentioned?

Mr. SHADBOLT thanked the members for the kindly sentiments they had expressed towards him. The oil in the washer was composed, as far as he could see, to a great extent of what they ordinarily called in the tars light oils. Copies of the complete specification of the patent were in the room;* and members would there see that he and his co-patentee distinctly claimed that these light oil vapours returning in the foul gas helped to saturate some of the heavier of the light oils, and carried them forward out of the influence of the already deposited tar. They all knew what was the effect of the heavier hydrocarbon in the liquid form upon the lighter when in the form of vapour; and if the heavier vapour was carried forward, there was every possibility of it becoming fixed. That was what they claimed in this patent.

Mr. W. J. Jenkins, of Retford, then read a paper entitled "Observations on the Construction and Working of Regenerator Settings." Pressure on space to-day compels the holding over of the paper and the report of the discussion to which it gave rise.

The next item on the *agenda* was the proposed discussion on residuals; but time did not permit of the subject being taken up.

ELECTION OF OFFICE-BEARERS.

In consequence of the fixture for the spring meetings, the Committee had determined that the officials elected on this occasion should hold their positions for eighteen months, in order to enable future Presidents on assuming office to deliver their inaugural addresses in their own towns.

Mr. CHILD moved that Mr. Jolliffe be elected President for the ensuing eighteen months. Mr. Jolliffe had always shown a desire to assist the Association in every possible way; and he (Mr. Child) was sure he would prove a valuable President.

Mr. TROUGHTON seconded the motion, which was cordially agreed to.

Mr. JOLLIFFE remarked that he was very sensible of the honour the members had done him; and, having elected him, he would do his best for the interests of the Association.

Mr. WIMHURST moved that Mr. Child be elected to the position

*An abstract of the specification appeared in last week's "JOURNAL," p.504.

of Vice-President. He had known Mr. Child for 21 years, and had always found him a most courteous adviser. He was sure he would do credit to the Association as its President, if he followed, as they all hoped he would, Mr. Jolliffe in the chair.

Mr. FENWICK seconded the motion, which was carried.

Mr. CHILD observed that his connection with the Association had been a comparatively short one; and he therefore took it as a great compliment that they should have elected him to the office of Vice-President.

On the proposition of Mr. BARTON, seconded by Mr. SHADBOLT, Messrs. Smithard and Fenwick were elected members of the Committee.

Messrs. C. Panchen and C. Ellis were re-appointed Auditors, and Mr. Troughton was re-elected to the office of Honorary Secretary and Treasurer.

VOTES OF THANKS.

The kindness of Messrs. Shadbolt and Jenkins in preparing papers for the meeting having been acknowledged, the members heartily thanked the Mayor and Corporation for the use of the Town Hall and for their hospitable entertainment.

Mr. BARTON then moved that the best thanks of the members be accorded to the President for the attention he had given to the affairs of the Association during his term of office.

Mr. JOLLIFFE said the President's conduct in the chair had been all that one could desire; and the members would be wanting in common courtesy if they did not convey their thanks to him with acclamation.

The motion was heartily passed.

The PRESIDENT having responded,

Similar complimentary votes were passed to the Committee, the Auditors, and the Hon. Secretary and Treasurer.

This concluded the business before the meeting.

Shortly afterwards the members and their friends dined at the White Hart Hotel; and they were honoured by the presence of the Mayor and Aldermen Tomlinson and Plant. A long toast list was gone through; and several gentlemen greatly enhanced the pleasure of the evening by contributing songs.

On the following day, a party, numbering about 25, drove through the much-admired neighbourhood of "The Dukeries." Lunch was served at the Royal Oak, Edwinstowe; but, during the halt, there was unfortunately a heavy shower of rain, which somewhat curtailed the trip. Notwithstanding this, everyone was well pleased with the outing.

PACIFIC COAST GAS ASSOCIATION.

The Fourth Annual Meeting at San Francisco.

(*Concluded from p.* 501.)

Mr. C. F. Adams, of Portland (Oregon), in a paper on "Water Gas," recounted the difficulties he had experienced in learning to work a Lowe apparatus with double superheater, most of which appeared to be caused by want of care in adjusting the heats. A representative of the makers, who came to ascertain the cause of their trouble, suggested working with excess of steam and high heats; and though this was contrary to the instructions, it led to much better results. They used Welsh anthracite, gas coke and oven coke in the generator, and Peruvian oil 36° B. or Los Angeles 15° B. for carburetting. Some trouble was experienced by the large quantity of heavy tarry residue from the latter; but by enlarging the outlet-pipe from 10 inches to 14 inches diameter, and taking care to keep the seal-boxes clear, this was readily dealt with. The Peruvian oil entered the generator at about 400° Fahr.; and the Los Angeles oil, at nearly 600°. Average working results showed a consumption of 4½ gallons of oil and 45 lbs. of generator fuel per 1000 cubic feet of 27-candle gas made, and a make of 2770 cubic feet per run. If able to work continuously, he would have better results; but he could only work about 14 hours per day.

The President invited discussion, and said that the Los Angeles oil was not suitable for the Lowe apparatus. Mr. Eichbaum enlarged on the importance of injecting the oil in a finely divided state into the carburettor—especially if a heavy oil was used. Mr. Cline could use oil of about 17° B. without trouble. There was an occasional accumulation of carbon in the superheater, which required to be burnt out. He used about 5 gallons of crude oil per 1000 feet made and found it necessary to screen the oil to get out the sand. He employed a mixture of Los Angeles and Peruvian oil; and he took care to get it well heated before injecting it into the carburettor. Mr. Collins spoke in favour of the double superheater for heavy oils. Mr. Powers drew the conclusion that water gas was all very well for large works, where it could have plenty of attention, but that works making 60,000 cubic feet per day or less would do well to stick to coal gas.

Mr. O. M. Gregory read a paper on "Enrichment of Coal Gas;" giving the results of three months' working with shale, three with gasoline, and three with petroleum. The quantity of shale used was about 36 tons, mixed in with about 440 tons of Wallsend coal; being 7½ per cent. of the whole. The yield of gas was nearly 5¾ million cubic feet, or 4·89 feet per pound of the mixture. The shale cost over £5 per ton, which was equal to 9d. per 1000 cubic feet of gas. The gasoline was supplied direct to the hydraulic main from a 60-gallon overhead tank, fitted with a glass gauge tube, at the rate of 1½ gallons per hour. A drip-box near the exhauster was examined from time to time, for traces of precipitated gasoline, which would be found if too much was used. The gas would take up any amount of 87° B. gasoline; but when working with 70° B., some care was needed to avoid excess. About 600 tons of coal, with 1½ per cent. of gasoline, gave over 6 million cubic feet of 17-candle gas, or 4·63 per pound of the mixture; and the cost of the gasoline was 7d. per gallon, or 3½d. per 1000 cubic feet. The gasoline would have yielded better results if the suppliers had kept up its quality. The petroleum was applied by saturating sawdust with it, and making up bundles representing 2 gallons of oil each, with old sackcloth, which were thrown into the retort immediately before replacing the lid after charging with coal. The amount of 17-candle gas yielded by 440 tons of coal, with 3½ per cent. of petroleum, was just over 5 million cubic feet or 5·2 feet per pound of the mixture. The cost of oil, sawdust, and sacking represented 4d. per 1000 cubic feet of gas. He preferred the gasoline method; and thought that if gasoline not under 74° B. could be supplied at a moderate price, a good demand for it would soon arise.

The next item on the programme was the report of Mr. T. R. Parker, the Editor of the "Wrinkle" Department, which comprised twelve paragraphs, many of which were illustrated with diagrams. The first was an illustrated description of a simple still, with cooling worm, for converting tar into pitch; the light oils, &c., being condensed and used for making gas. The second treated of ink used for pressure-registers; and the author had found glycerine coloured with any aniline dye to be very suitable. No. 7 was an ingeniously devised wooden truss applied to the outside of the roof of an iron-trussed holder, used while suspending the same during repairs to the inlet and outlet pipes. No. 8 was a diagram of a complete set of apparatus for using oil as an enricher in connection with ordinary retorts. A safety arrangement for stopping the engine if the exhauster strap should break, thus avoiding racing, was the subject under No. 11. No. 12 comprised complete working drawings of a hot scrubber on the large scale, with 24-inch connections. They showed a rectangular vessel 20 feet by 12 feet by 3½ feet wide; having five inclined diaphragms or shelves, so arranged as to cause the gas to travel from end to end six times, and to return condensed liquids to the base, at which point the inlet was situated.

Mr. John Clements, of Red Bluff (Cal.), followed with some items that had been contributed to him as Editor of the "Experience" Department. These dealt with various matters of local interest. One gentleman had found that the cost of maintaining 672 Welsbach lamps averaged just under 3d. a lamp per month.

The meeting then proceeded to consider a long list of questions from the Question-Box. Among other things, it was decided that 15-10ths was a sufficient day supply pressure for cooking-stoves. The President stated that prepayment meters had not been a success in San Francisco; the trouble being that they registered 5 to 10 per cent. slow. He believed that this was the usual experience; and that the meters had to be set to a higher rate to compensate for it. Mr. D. J. Collins, had tried a few, but found they did not do very well. Mr. Parker found prepayment meters satisfactory, but objected to their cost. One question was: "Assuming a Springer set to be 9 feet diameter and 26 feet high, what advantage will follow by adding 5 feet to the shell, increasing the capacity of the superheater to this extent?" It was agreed that such an addition will add to the efficiency, and economize oil. It was also agreed that, in a cold climate where the frost penetrates several feet into the ground, it was better to lay the mains shallow than below the frost line, because in the latter case trouble arose from stoppages in the service-pipes. Mr. Wharton said that at Tacoma, he had tried guaranteeing to maintain Welsbach lamps for 5d. a lamp per month, but found that he lost money. However, he thought that it was well spent, for the sake of the advertisement. He had tried to get some reduction or allowance from the Welsbach Company, but without success. The breakage in transit and fixing was 10 per cent. of the whole; and this loss had to be met before a single foot of gas was burned. He suggested that the Association should take some combined action, with a view to getting a rebate for broken mantles. Mr. Burrows said his experience was different. In his case, the breakage before lighting was not 1 per cent. He thought, however, the Welsbach Company were very arbitrary in their dealings, and that the action suggested might have a good effect. The lamp was a great success with his customers. Mr. Meyer agreed that there was a great deal of breakage in transit, for which a rebate should be allowed. The exhibition of a sample of wood fibre pipe caused many members to recall experiences with wooden pipes. Several had tried the fibre pipe, and found it quite gas-tight; and it was neutral to electricity, while only about two-thirds the cost of cast-iron pipe. In some parts of California, it appeared that the iron pipe was cheaper, and that the question of freightage determined the actual cost.

In the course of the usual votes of thanks, a very handsome album containing photographs of the members was presented to the President.

THE ACTION OF WATER ON CEMENT.

Herr A. Stutzer, writing in the "Zeitschrift für Angewandte Chemie," gives an account of some interesting observations on the above subject. A reservoir constructed nine years ago, of portland cement concrete, for the water supply of a small town on the Rhine had become coated, particularly on the bottom and lower portions of the walls, with a brownish slime, while the cement had been partially extracted from the concrete. The cement above the water-level contained lime and ferric oxide in the proportion of 10 to 1, and had an alkaline reaction; but the slime on the concrete contained when dried nearly equal percentages of these substances, and was neutral. The water was very pure, and yielded on evaporation only 0·205 part of residue per 1000. At another town on the Rhine, a similar observation was made; and it was concluded, after consideration of all the facts, that the lime was removed from the cement by the solvent action of carbonic acid in the water. The water from springs in the valley of the Rhine is charged with carbonic acid; and this evidently dissolves out the lime of the cement as bicarbonate, and thus destroys the concrete. The action is most marked at the bottom of reservoirs, where the dissolved carbonic acid is forced by the pressure of the superincumbent water into the pores of the concrete.

Dr. W. Michaelis has recently published a work on the subject of the behaviour of hydraulic cement with sea water. Portland cement contains much free lime, which is converted into gypsum by the sulphates of sea water. There is a consequent increase in bulk, and the binding power of the cement is destroyed. The free lime is dissolved first, then the lime combined with ferric oxide and alumina, and lastly the calcium silicate. Therefore to preserve cement from the action of sea water, silica in the form of trass should be added to it, in the proportion of about 1¼ parts of trass to 1 part of portland cement. The free lime is saturated by the silica, and the mortar is thus unacted upon by the sea water. In fresh water, Dr. Michaelis considers that the free lime may be either dissolved out or converted into carbonate. If taken into solution, the combined lime remaining is so much the more difficult of solution. But Herr Stutzer's observations, while so far confirming Dr. Michaelis' views, go to prove that, if the fresh water contain much carbonic acid, complete destruction of the cement may, under certain circumstances, occur.

THE FORMATION OF CARBON DIOXIDE IN BURNING CARBON COMPOUNDS.

At a recent Meeting of the Chemical Society, Mr. Harold B. Dixon, M.A., F.R.S., Professor of Chemistry and Metallurgy in Owens College, Manchester, read a paper on the above subject. The following abstract is from the "Chemical News."

Assuming that in the combustion of carbon compounds the carbon burns first to carbonic oxide, the author discusses the views that have been advanced concerning the function of steam in promoting the union of carbonic oxide and oxygen. Professor Armstrong considers that the moisture acts as an electrolyte, and that chemical change only takes place when carbonic oxide, steam, and oxygen are in contact. The chief difficulty in this theory is to account for the great velocity with which the explosion wave is propagated through a damp mixture of carbonic oxide and oxygen. In gaseous mixtures, the rate of explosion approximates to the rate of the forward movement of the reacting molecules—*i.e.*, the wave is transmitted like sound from molecule to molecule. According to the electrolytic theory, the chemical change could only occur on the simultaneous collision of at least three molecules; yet the explosion wave is propagated in carbonic oxide, steam, and oxygen at a rate of 1738 metres per second. In the explosion of cyanogen, carbon dioxide is formed without the intervention of steam. This theory, which has the advantage of including a number of cognate phenomena, seems better suited to explain reactions at ordinary temperatures than those occurring in the explosion wave.

A similar difficulty occurs in Professor J. J. Thomson's theory, according to which the steam, by forming liquid particles, produces dissociation of the oxygen molecules, and thus facilitates the oxidation of the carbonic oxide. It is hard to understand how steam, which is far below the saturation point at ordinary temperatures, can be condensed in the explosion wave.

Mendeléeff considers that carbonic oxide cannot combine directly with oxygen because all combination between gases takes place according to the law of equal volumes. Carbonic oxide and steam react in equal volumes, and therefore the change begins by the carbonic oxide taking the oxygen from the steam. The liberated hydrogen unites with its own volume of oxygen to form hydrogen peroxide; and this in turn reacts with its own volume of carbonic oxide to form carbon dioxide and water. The spark will not, however, kindle a mixture of dried carbonic oxide and nitrous oxide (mixed in equal volumes); but addition of a trace of steam renders the mixture explosive.

Lothar Meyer and Beketoff attribute the influence of the steam to the fact that the direct action of carbonic oxide on oxygen requires a very high temperature; whereas carbonic oxide decomposes steam much more readily. But although it may be true that steam facilitates the oxidation of carbonic oxide on account of the low temperature of the reaction, this does not account for the non-union of carbonic oxide and oxygen at the intensely high temperature produced in the wave-front in the explosion of cyanogen.

The author shows that a dried mixture of carbonic oxide and ozonized oxygen is not inflamed by the spark. Here the resistance cannot be attributed to the stability of oxygen. The author has repeated Beketoff's experiment of exploding together a mixture of cyanogen, carbonic oxide, and oxygen in the dry state. With quantities of cyanogen below 12 per cent., the flame causes an incomplete combustion of the carbonic oxide. The same results were obtained when carbon bisulphide was substituted for cyanogen. The more intense the exciting flame, the larger was the amount of carbonic oxide burnt.

The dissociation of carbon dioxide, held by Bunsen and Deville to limit the combustion of carbonic oxide and oxygen, may be the reason why carbonic oxide and oxygen do not unite in the wave-front, but can combine as the gases cool down behind the wave. The reaction between steam and carbonic oxide gives out little heat, so carbonic acid might be formed indirectly, and the liberated hydrogen might re-form steam, which could exist at a temperature at which carbonic acid would be broken up. The union of dry carbonic oxide and oxygen, without flame, on the surface of platinum, may be due partly to the power of the metal to conduct away heat.

The dissociation theory explains some of the facts observed concerning the combustion of carbonic oxide; but probably some other cause exists which limits the union of carbonic oxide and oxygen at lower temperatures. The Röntgen rays do not appear to make a dried mixture of carbonic oxide and oxygen inflammable.

REGISTER OF PATENTS.

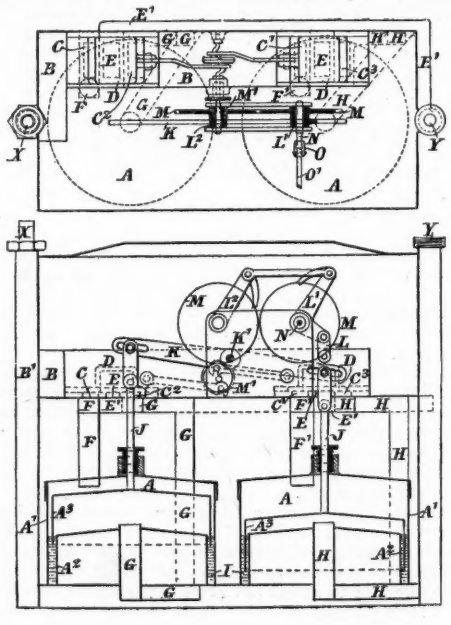
Gas and Oil Motor Engines.—Campbell, H., of Halifax. No. 16,609; Sept. 5, 1895.

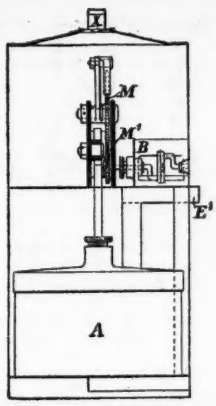
The first part of this invention has reference to the means employed for governing either gas or oil engines. These means consist, in the first place, of an ordinary horizontal reciprocating rod, actuated by gearing from the crank-shaft of the engine. The forward end of this rod is used for the purpose of opening the exhaust-valve; but on to the forward end of the rod is mounted loosely a pendulum governor. When the engine is running at its normal speed, a finger of the pendulum governor comes into contact with a short rod attached to one end of the lever; the other end of the lever being connected to a horizontal rod in connection with the inlet-valve. Therefore, when the engine is running at its normal speed, at each backward movement of the pendulum governor, the finger strikes the short rod, and opens the inlet-valve; but if the engine is running too quickly, the finger lowers and misses the short rod. Failing to strike it, the inlet-valve will consequently remain closed until the engine reaches its normal speed; when the finger will assume its horizontal position, and strike the rod to open the valve.

The second part of the invention refers solely to oil-engines—to a new form and construction of vaporizer.

Gas and Other Fluid Meters.—Greenall, J., of Leeds, and Heaton, T. T., of Nunhead, S.E. No. 17,850; Sept. 24, 1895.

This invention "has for its object to provide a meter which will dispense with the use of water, and will not require leather in its construction, and which will not be subject to the variations and uncertainties of measurement and working which occur in wet and dry meters now in general use for gas." The invention is applicable to the measure-





ment of gas and other fluids, but is described in the patent specification chiefly with reference to gas.

The illustrations show a sectional plan, a vertical longitudinal section through the centre of the cylinders, and a transverse section through the centre of one modification of the invention. A are two cylinders, each consisting of an outer portion A^1 and an inner portion A^2, between which works a hollow piston A^3, actuated by the gas to be measured. This is admitted at the inlet X into a valve-box B. At the point B^1 it passes by ports C C^1 C^2 C^3, as regulated by the valve-covers D, into one or other of the cylinders, either above or below the piston. The gas returns through the same passages by which it has entered the cylinders into the hollow under the valves D, through the exhaust-ports E, and into the passage E^1, by which it proceeds to the outlet Y. The gas which has to enter the upper portion of each cylinder, and act upon the top of the piston, passes through the port C or C^1 and the passage F or F^1 into the cylinder; while that which has to enter the bottom part of each cylinder and act upon the underside of the piston, passes through the port C^2 or C^3, and through the passage G or H into the cylinder.

The valves are slide-valves, acting in the same way as in an ordinary steam-engine or dry meter. The gas is prevented from passing from the top to the bottom of the cylinders, or *vice versâ*, by a seal I of mercury or amalgam, or other suitable material. The pressure of the gas upon the pistons causes them to move first in one direction and then in the other, according as the gas is admitted to the upper or lower side of the piston.

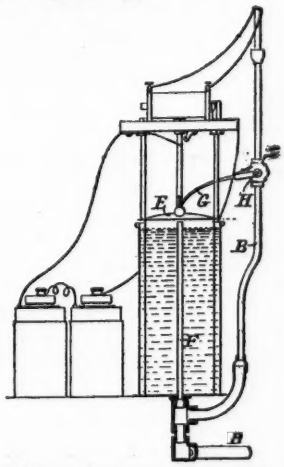
The motion of the slide-valves is obtained by the following mechanism: The piston-rods J act upon a double lever K pivoted at K^1, and give to the lever a reciprocating motion, which is transmitted by the link L to the bell-crank ratchet-lever L^1, attached to a second ratchet-lever L^2. The pawls of these two levers actuate the two ratchet-wheels M, and through these give a practically continuous motion in one direction to the pinion M^1, which is attached to a double crank-shaft transmitting the motion to the slide-valves.

The shaft N, to which one of the ratchet-wheels M is keyed, actuates through the coupling O the shaft O^1; and this shaft actuates mechanism of the ordinary kind for recording on a dial the quantity of gas passed through the meter.

The correctness of the measurement is regulated by means of two slots (in which screws or other suitable means of adjustment are employed), one in each end of the lever K. The angle through which the lever moves is invariable; but by fixing the studs in the slots referred to nearer to or farther from the pivot of the lever, a variation in the stroke of the pistons is effected, which regulates the quantity of gas per stroke passed through the meter.

Automatically Lighting and Extinguishing Street-Lamps.—White, W., of Brunswick, and Wallace, J. A., of Melbourne, Australia. No. 18,257; Sept. 30, 1895.

This invention consists of improvements in the apparatus for automatically lighting and extinguishing street and other gas-lamps, described in patent No. 412 of 1895.



According to that invention, the gas to be supplied to the lamps was led from the main to a small holder (constructed like an ordinary gas-holder), fitted near the base of the lamp, and thence to the burner through a pipe passing through the dome of the holder, and projecting downwards sufficiently far to ensure its lower end being sealed by the water in the holder when the pressure of gas was reduced below a certain point.

In practice, however, the patentees have found that it is sometimes necessary to keep the lamps alight, even when the pressure is reduced; and conversely, they are not always required to be lighted when the pressure is increased. Their present invention, therefore, consists in arranging for the gas to be supplied to the lamps through a pipe leading directly from the main to the burner on a convenient point, and in which pipe is placed a tap or cock, arranged to be operated by the rise and fall of the small holder at the foot of the lamp by suitable intermediate gearing—such, for instance, as a weighted arm or lever, which would rise and fall with the rise and fall of the holder.

In the illustration, B is a pipe leading from the gas-main to the lamp-burner; and on it is a four-way cock, fitted so as to be operated by the rise and fall of the holder at the foot of the lamp—being led into the holder by a small pipe F, also leading from the main. G is a weighted arm or lever, arranged to rise and fall with the dome or top of the gasholder E, and which is fitted with a pawl, which works into teeth on a ratchet ring or wheel H, fitted on the spindle of the tap, so that as the dome moves upwards it will turn the tap to a certain extent, and on its return will slide over the face of the ratchet-teeth and gear into the next tooth, so as to still further operate the tap when the dome again rises.

In order to turn the valve into its open position, it is necessary for the pressure of the gas to be increased to its operative pressure, so as to raise the dome E and cause the pawl to engage with the tooth of the ratchet-wheel H, and turn the tooth into its highest position. After this, when the pressure is again reduced, the pawl will be brought back into engagement with the next tooth. When the dome of the holder rises by increase in pressure, it completes an electric circuit (as described in the previous patent), and, by means of an electric spark, lights the lamps. When this is effected, the pressure is reduced to its normal point; the holder falls; and this breaks the electrical contact, as the current is no longer required.

The dome E may be weighted (by adding thin pieces of lead to it), so that it will remain unaffected by the maximum pressure ordinarily used in the main for any other than lighting purposes, and will only be affected by high operative pressure. This weighting is also regulated to bring the different lamps in a district, whether at a higher or a lower level, to act uniformly. The operating pressure may be from 12-10ths upwards, according to circumstances; but it should be 5-10ths above the maximum pressure ordinarily required.

Generating and Regulating the Consumption of Acetylene Gas.—Bayley, J. C., of Bournemouth. No. 19,771; Oct. 21, 1895.

This apparatus, in its most simple form, consists of an inverted cylinder, having its upper end either closed or made to open, and its lower end open—the plates forming the bottom having their lower edges serrated or perforated. Near the top are placed one or more perforated or reticulated trays, for the purpose of carrying a supply of carbide of calcium or other substance suitable for producing acetylene gas when brought into contact with water. The vessel is placed, open end downwards, in a larger vessel suited to contain water, and preferably covered on the top. From the interior of the inner vessel, a pipe communicates directly with the burners.

When in operation, the inner vessel has a supply of calcium placed upon the trays; and, the tap being closed, it is placed open end downwards in the outer containing vessel, into which sufficient water is poured to cover the inner vessel. The air contained in the inner vessel is compressed slightly by the weight of the water and of the inner vessel; and the contained air forms a cushion, which prevents contact of the water with the calcium. Upon the tap which governs the outlet of gas being opened, the air contained in the inner vessel is forced out. The water is thus allowed to come into contact with the calcium; and the usual reaction takes place, resulting in the formation of acetylene. This immediately forces the water downwards in the inner vessel, and upwards in the containing vessel; preventing further generation of gas. When the quantity of gas already generated has been consumed, the water once again rises so as to come into contact with the calcium, and generate a further supply; and these operations are repeated until the carbide is exhausted.

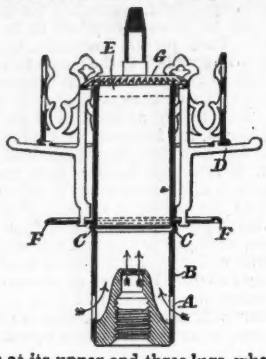
The water, instead of surrounding the main vessel, may be contained in a separate tank communicating with the vessel by a pipe, in which is placed a check or back-pressure valve, so as to allow the water to return to the tank through the valve, but not to return again to the vessel. Connected to the water-tank side of the valve, is a small pipe or bye-pass, in which is a stop-valve. This bye-pass leads direct to the vessel; but it only allows a small quantity of water to pass. The object of the small pipe is to allow the water to run into the vessel very slowly, so as only to moisten the lower layers of calcium before the gas starts generating.

Incandescent Gas-Burners.—Schuch, J., of Rixdorf, and Kneidel, H., of Berlin. No. 12,610; June 9, 1896.

The characteristic feature of this invention is the combination of a cylindrical mantle carrier and its mantle support with a mixing disc; the parts being so fitted together that they can all be easily removed, at the same time, for cleaning or repairing.

The gas-pipe B, furnished with air-holes A, is provided with a moulding C, above which are placed three brackets D held together by a guide-ring E at the top, and by another ring F at the bottom. The three brackets riveted to the ring F support, at their upper ends, the mixing-disc G. The gas-inlet pipe extends to the mouth of the burner, without admitting air or interfering with its subsequent admission. The air-holes in the burner-tube serve to produce the action of a bunsen burner, or for the sake of simplicity an ordinary argand burner may be employed. The end of the gas-inlet pipe is screw-threaded, to receive the nipple of the burner, which has screwed on it a short tubular extension, about 25 mm. in length, provided with four holes arranged diametrically opposite each other, and on the same line as the holes A of the burner-tube, which is fitted telescopically on the extension. By turning the tube B along with the parts placed above it, the air-holes

A can be brought over the air-holes in the nipple, so as to coincide therewith, and allow air to enter the tube B, in order to give a bunsen flame; or, when desired, the entrance of air can be prevented by turning the tube B, so as to cover the holes and give an argand flame. The



burner-tube carries at its upper end three lugs, whereto the mixing-disc G is riveted in such a manner that the latter projects slightly above the end of the burner-tube, in order to prevent, by the circulation of air, too high a temperature. The mixing-disc has fitted centrally on it a support, to which the mantle is fixed in the ordinary manner. The disc G is provided with teeth on its periphery, which may be undercut, as shown, or made to taper upwardly. The object of having the teeth is to break up the gas ascending the tube B into small currents, which are "whirled about" and intimately mixed with the air before reaching the mantle.

Lighting Railway Carriages.—Thompson, W. P.; a communication from A. Dempster, of Melbourne, Australia. No. 11,809; May 30, 1896.

This invention of "apparatus for lighting railway carriages and similar vehicles" consists in a combination of an air-compressor, an air-filter, a storage cylinder (to keep the lights temporarily going in the event of the air-compressor stopping for a time), a pressure-regulating mechanism, a carburetting mechanism placed beneath the carriage, a mixing valve for regulating the proportions of carburetted air, a slotted adjusting tap for regulating the exact amount of combustible admitted to the burner, and a platinum burner. The source of compressed air in railway carriage installations might be from the Westinghouse pump which actuates the vacuum brake, or a special pump of similar pattern exclusively for the lighting apparatus might be employed, preferably also placed on the locomotive. In other installations, a pump driven by suitable mechanism would be provided, or a supply of compressed air from an outside source arranged.

Gas-Burners for Incandescent Lighting.—Martini, A., of Berlin. No. 13,658; June 20, 1896.

This invention has for its object "to produce a flame of higher temperature, in which there is perfect combustion, and by which, owing to its peculiar shape and to perfect and rapid combustion, the mantle is more uniformly heated, and consequently its life is prolonged to the utmost limit." The further object aimed at is "the utilization of gas rich in carbon—such as petroleum vapour—which it is impossible to perfectly burn in the usual burners, and by the evolution of greater heat of flame to utilize a mantle of less fragile and more durable materials than it is possible at present to employ." The patentee proposes to attain these objects "by providing for the intimate admixture of the particles of gas and air in mixing chambers, and for the admission of air at a number of points in the path of the mixture to the burner; by providing for the admission of air, to effect combustion, from within and without; and by providing a number of surfaces to the flame in issuing from the burner, for the greater contact of air."

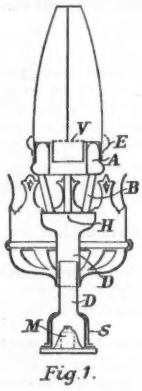


Fig. 1.

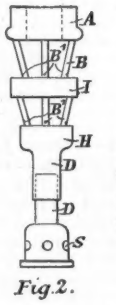


Fig. 2.

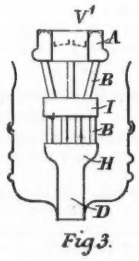


Fig. 3.

Fig. 1 is a sectional elevation of a lamp-burner made in accordance with the invention. Figs. 2 and 3 are modifications—the latter being a part sectional elevation of a burner in which an intermediate mixing chamber is employed; and the former an elevation of a construction similar to fig. 3, in which intermediate air-admission holes, however, are provided in the connecting-tubes.

The burner consists of a tube D, at the extremity of which a nozzle M is secured for the admission of gas, and holes S are provided for the admission of air. A regulator is also provided as a ring, having corresponding holes to those formed at the extremity of the tube; so that the air supply may be cut off in such cases as when a mantle is destroyed, and it is required to instantly obtain a luminous flame. A mixture of gas and air passes up through the tube, and impinges against a plate H, upon which is provided a circular series of tubes B, through which gas and air may pass into the annular chamber A, upon the circular annular aperture of which is placed a gauze or a series of holes for the issue of gas and air to form the flame.

As shown in figs. 2 and 3, provision for the more intimate admixture of gas and air may be made by employing an intermediate mixing chamber I, or (as seen in fig. 2) intermediate air-admission holes may be made in the connecting-tubes B for a greater admixture of air.

There is a ring E upon the burner to be used when it is desired to produce a luminous or argand flame by the non-admission of air with the gas to be burnt. Such ring serves as an impact or diverting surface for the flame. Also there may be a cap V (fig 1) upon the aperture of the annular burner, in which small holes are made for the admission of air required to feed the flame upon its inner face. Such cap serves to support the mantle by means of a pin or carrier screwed at the centre of the cap, at the utter extremity of which the mantle is secured. The mantle may, however, be supported by a rod passing through the inner aperture of the burner and secured upon a plate H, so as to dispense with the supporting cap V.

Purifying Water.—Waterman, W. G.; a communication from L. Alers-Hankey, of New York. No. 15,611; July 14, 1896.

This invention relates particularly to apparatus which purifies water by bringing it into contact with scrap iron, or iron in a finely subdivided state—such as borings, turnings, punchings, or the like. It consists in the means employed for aërating water; in the receptacles provided for holding the iron, by which purification is effected, and for carrying the same through the water; in the means for obtaining a very uniform action of the apparatus; and in the combination, construction, and arrangement of the parts of the apparatus.

The objects of the invention are: First, to provide efficient means for aërating the water within the apparatus, and oxidizing the ferrous salts contained therein; second, to provide means for aërating water which shall require little power to drive, and which shall be uniform in its action; third, to provide means for securing the uniform distribution of the iron throughout the apparatus; and, fourth, "to make the apparatus simple, easy of operation and maintenance, easily charged and cleaned, and as inexpensive as possible."

APPLICATIONS FOR LETTERS PATENT.

19,691.—Parkin, B., and Pickering, W. S., "Enriching gas for illuminating and other purposes." Sept. 5.
19,802.—Thorp, T., and Marsh, T. G., "Lighting railway carriages and the like." Sept. 8.
19,841.—Boddam, E. M. T., "Producing gas for purposes of propulsion." Sept. 8.
19,845.—Vidal, P., "Coin-freed machines for supplying liquids, powders, and the like." Sept. 8.
19,861.—Fraipont, L. E., "Apparatus for the vaporizing of petroleum, heavy oils, tar oils, and hydrocarbons generally." Sept. 8.
19,889.—Crowe, R., "Incandescent gas lamps and burners." Sept. 9.
19,899.—Prince, F. O'Connor, "Internal combustion motors." Sept. 9.
19,953.—Kremer, G., "Improvements in the production by the cold process of gas for lighting and motive power, and apparatus therefor." Sept. 9.
19,957.—Wellstein, H., "Incandescent mantles." Sept. 9.
19,973.—Bode, P., "Incandescent gas-burners." Sept. 9.
19,979.—Rolf, A., "Incandescent gas lights." Sept. 9.
20,029.—Shepherd, J. L., "Protecting incandescent or hollow-flame gas lights." Sept. 10.
20,043.—Prince, F. O'Connor, "Internal combustion motors." Sept. 10.
20,074.—Gaskell, G. W., and Gibbs, R. R., "Generation and storage of acetylene." Sept. 10.
20,083.—Hughes, W. W., and Willson, S., "Generators for acetylene gas." Sept. 10.
20,084.—Hughes, W. W., and Willson, S., "Treatment or utilization of peat and its products." Sept. 10.
20,090.—Chesnay, E., and Pillion, L., "Apparatus for generating and storing acetylene gas." Sept. 10.
20,104.—Dyken, B. Van, "Manufacture and utilization of acetylene gas." Sept. 11.
20,125.—Young, W., and Glover, S. and T., "Improvements in the manufacture of illuminating gas." Sept. 11.
20,186.—Cripps, F. S., "Globe cleaning machines." Sept. 11.
20,209.—Thomas, W. C., "Charging gas-producers." Sept. 12.
20,216.—Watson, W., and Hudson, R., "Improved system of illuminating." Sept. 12.
20,247.—Loewenberg, G., "Automatic gas-lighting apparatus for incandescent gas lights." Sept. 12.
20,254.—Chesnay, E., and Pillion, L., "Generating and storing acetylene gas." Sept. 12.

Sales of Stock and Shares.—A few days since, Messrs. T. Edwards and Sons sold at Stoke-on-Trent £5000 of ordinary stock in the Staffordshire Potteries Water Company. The price realized varied from £173 to £175 per cent. Thirty fully-paid £5 shares in the Brompton, Chatham, and Gillingham Water Company, on which a dividend of 10 per cent. has been paid, have recently changed hands—four at £16 each, three at £15 18s. each, eleven at £15 17s. each, and twelve at £15 16s. each. Five fully-paid £5 shares in the Maldon (Essex) Water Company were sold by auction last Wednesday for £4 17s. 6d. each. One £20 share in the Hastings and St. Leonards Gas Company lately realized £50 5s. A £50 parcel of ordinary stock in the Broadstairs Water Company recently changed hands at £63; and a parcel of 4 per cent. debenture stock in the same Company was sold at the rate of £8 5s. for each £7 10s. of stock. Five "A" shares of £5 each in the Deal Water Company fetched £13 7s. 6d. each. A parcel of £5 shares, on each of which £4 10s. had been paid, in the Cranleigh Water Company secured £8 2s. each; and 150 new ordinary £2 10s. shares in the York Town and Blackwater (Surrey) Gas Company produced an average of £3 17s. per share.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

Mr. Damon and the Evans Photometer.

SIR,—Mr. Damon has at last enabled your readers and myself to understand the nature of the "mechanical alterations" he took upon himself to carry out on the Evans photometer under his charge at the Ladbroke Grove testing-station, as he says, for "experimental purposes." I think he has established the truth of my contention that it was not the photometer but the ventilation of the room to which "mechanical alterations" should have been applied. At the same time, Mr. Damon has shown that it is at least inexpedient (as I pointed out in my first letter of July 23 last) that a gas examiner should make alterations to the photometer under his charge.

The original Evans photometer, as prescribed by the Gas Referees for the Ladbroke Grove testing-station, had been in use some twenty years or more before Mr. Damon took to making mechanical alterations to it. Mr. Damon admits that this original photometer will give good results in my large and well-ventilated photometer room. Clearly, then, the photometer could not have been the cause of his obtaining inaccurate results; and his experiments were misleading.

It would not have been difficult to have at once found out whether or not the photometer was in fault, by having it placed in a properly ventilated room alongside the more modern Canadian Government standard photometer about which there could be no doubt, because it has received the sanction of the Standards Department of the Board of Trade. Only the photometer required to have been removed for that purpose. How much better this would have been than for the gas examiner to make "mechanical alterations" because he thought his results "abnormal." Every photometer in London may be readily proved in this manner; and I submit that there is no other method which will really show whether or not a photometer is accurate.

Mr. Damon's argument that the Evans photometer must be a bad one because it can, by "mechanical alterations," be made to give variable results, I venture to characterize as "evidently puerile," because every photometer, of whatever kind it may be, as well as any other scientific instrument, is open to the same objection. How far-reaching this phrase "mechanical alterations" is, is shown in the paragraphs of Mr. Damon's letter marked 1, 2, and 3.

As to the removal of an Evans photometer from the Hill Street testing-station of the South Metropolitan Gas Company, which Mr. Damon alleges is another proof that the Evans photometer is bad, I say it is true that a Gas Referees' Tooley Street pattern photometer was put in the place of the old Evans photometer, which had been (after many years' good service) *altered* under the instructions of the Gas Referees to the Ladbroke Grove pattern. I have yet, however, to learn that the cause of its removal was the difficulty of obtaining "concordant results," whatever that may mean.

The Evans photometer referred to by Mr. Damon which appears on p. 2 of my Company's catalogue of apparatus is not at all the Ladbroke Grove pattern, nor a copy of it, as a simple inspection of the photometer will show. I refer Mr. Damon to my paper read at the last meeting of The Gas Institute, published in the "JOURNAL" for June 30, and of which I will send him a copy if he has not one. The Ladbroke Grove pattern photometers are all with moveable candles and not fixed, as Mr. Damon's letter might lead your readers to believe.

Mr. Damon informs me in italics that he "never made alterations of any kind for official purposes." This I can readily believe, because no official test would be legal if any alteration had been made by the gas examiner to his photometer. My contention is that he ought not to dare alter his photometer for any purpose whatever.

The rest of Mr. Damon's letter being mostly reiterations of his fulminations against the Evans photometer, including a ridiculous assertion about the Dublin photometer, which have been dealt with in my former letters, I shall take the liberty of passing over it without further remark.

Plymouth, Sept. 18, 1896. WILLIAM SUGG.

The Permanency of Illuminating Gas.—We have received from Mr. A. F. Browne a long letter on the above subject, in reply to that of Mr. William Young in the "JOURNAL" for the 1st inst. It came to hand too late to appear in to-day's issue, but will be given next week.

LEGAL INTELLIGENCE.

Dealing in Gas Stokers' Gloves Alleged to be Stolen.

At the North London Police Court, before Mr. Paul Taylor, last Tuesday, William Wilks, a greengrocer, of Wallis Road, Hackney Wick, surrendered to his bail to further answer a charge, reported in the "JOURNAL" last week, of feloniously receiving, between July and September, about 30 pairs of leather gloves, the property of the West Ham Gas Company and other gas companies. Mr. Stephen Lynch prosecuted; Mr. Walter Windsor defended. Detective-sergeant Kemp, who gave evidence on the previous occasion, said he had received other gloves from Messrs. Berger, at Homerton, which had been purchased from the prisoner. Four pairs of these were new, and bore the stamp "W. H. G. C." (West Ham Gas Company). Mr. John Wright, the Assistant-Engineer at the West Ham Gas-Works, said he purchased stokers' gloves at 16s. a dozen, by taking large quantities. He identified the gloves now produced by the police as some of them—those stamped certainly, and those unstamped were similar. By Mr. Windsor: The men have, on an average, a pair of gloves each month. It is optional with them whether they use them or not. When they do use them and burn them, they cut the burnt portions off, and use the remaining portion as holders. The old gloves are never collected. The gloves are not considered to be the property of the men when being served out. Mr. Windsor asked witness if there had been a strike at his works; and Mr. Lynch objected to the question. Mr. Windsor inquired if it was not a fact that the men went home very frequently with these gloves. Witness said it was not. Robert Andrews, a foreman in the service of Messrs. Berger, said the prisoner came to him with a sample of gloves, and asked him to purchase. He (witness) said his firm used such gloves, and he would buy. He bought a quantity at 12s. a dozen, but declared that he saw no mark on any of them. He merely counted the packets—he did not look for marks, as he considered it a straightforward transaction. Mr. Lynch: What! purchasing gloves from a greengrocer? Witness said he never saw the prisoner to his knowledge until he came to offer the gloves. William Wheelwright, a storekeeper at Messrs. Berger's, was called, but said he did not know where the gloves came from, and it was not his business to inquire. Mr. Lynch asked for a further remand; saying that he and the police had the greatest possible difficulty in getting evidence for the prosecution. Mr. Taylor said he should have thought that people who ought to have been in the dock with the prisoner would be sufficiently grateful to tell all they knew of the matter. The prisoner was again remanded on the same bail—two sureties for £50 each.

The Voting Rights of New River Shareholders.

An interesting question came before the Revising Barrister (Mr. F. Mackarness) sitting at Kilburn on the 12th inst., in regard to the right of 63 persons to have their names retained upon the register of county electors in the Harrow Division of Middlesex, for the parish of St. Pancras, in respect of "freehold shares in the New River." Mr. Newbould, representing the Home Counties Liberal Federation, objected to the names remaining, on the ground that the water-mains and the reservoir of the Company in the parish of St. Pancras could not be properly described as the New River, the stream of which ceased at Clerkenwell; and, the Company being "a corporation aggregate," the individual shareholders were not possessors of a freehold interest in the corporation property which would entitle them to a vote, even were the property such as would qualify. Mr. J. A. Adams, for the Conservatives, contended, on the contrary, that, under the conveyance of the shares, the shareholders holding King's and Adventurers' shares were treated as being the holders of real estate in fee simple. Before a House of Commons Committee in 1790, possession of one of these shares had been held to entitle the owner to be a freeholder in the county of Middlesex. Mr. Macdonnell (now a Master in the Supreme Court) had held that for centuries New River shares had been treated as realty. Mr. Debenham, the Solicitor to the Company, was examined, and he asserted that, in the case heard before Mr. Macdonnell, New River shareholders were proved to have voted before the Reform Act. Mr. Key, in 1836, held that the possession of New River shares made the owner a freeholder. The Revising Barrister reserved his decision, which he gave last Thursday. He said he found, as a fact, that the land, ponds, and reservoirs of the Company were freehold property; and then it became a question whether the qualifying property was free land and tenement. Did a shareholder in the New River Company possess free land and tenement? It had been held in the early part of the last century that such a shareholder was a holder of realty. In 1804, a Committee of the House of Commons found the same thing; and in 1836, the question was discussed before the Revising Barrister for Middlesex, who came to the same conclusion. It was argued again in 1886; and the same conclusion was arrived at by his predecessor. Each shareholder of the Company had such an interest in the estate as to make him entitled to a vote. He disallowed all the objections. Mr. Newbould said he did not think it possible to succeed on appeal, though he should ask for a case to be stated for the opinion of the High Court. Mr. Mackarness pointed out that the whole matter was so covered by previous decisions, that he thought it unnecessary to go into facts; but he would willingly grant a case.

A Misunderstood Precept for Water-Rate.

At the Bearsted Petty Sessions, Mr. Walter Tassell, the Assistant-Overseer for Ulcombe, was recently summoned for refusing to meet a precept for £165, issued on the parish by the Hollingbourne District Council. Mr. H. J. Bracher, the Council's Clerk, stated that two precepts were issued on the parish for two sums—one for £100 being payable on Nov. 21, 1895, and the other for £65, payable on Feb. 1, 1896; these being special expenses incurred by the parish of Ulcombe in respect of the water supply. The duty of the Magistrates was, he said, simply to order a warrant of distress to issue; the defendant not being entitled to go into the question of the propriety of making the precepts or the amount of them. Mr. Tassell was under the impression that he ought not to make this rate, and had refused to make it without a Magistrate's order. As a matter of fact, the rate had already been allowed by the Bench; and if the defendant would give a guarantee that the rate should be placed in the hands of the collector at once, the case would not be pressed. Mr. Tassell said it was some time before the people of Ulcombe knew who would have to pay the special rate. They were first informed by the late Clerk that only those who used the public water supply would be rated; and then they were told some time afterwards that the rate would have to be paid by the whole parish. The ratepayers were greatly dissatisfied with regard to the levying of this charge upon them. Mr. Bracher said the Council could not make this a common law charge. The Court ordered a distress to be issued against the defendant, who was also mulct in costs. Defendant urged that it was not his duty to get in the rate. The Chairman said the Bench had nothing to do with that.

The Mundesley Water Scheme.—The Local Government Board have informed the Mundesley District Council that they are of opinion that the execution of the suggested water scheme as a whole should not be undertaken until it has been definitely ascertained that a sufficient supply of wholesome water can be obtained from the proposed boring; and they have therefore decided to sanction a temporary loan to defray the cost of sinking the boring.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Sir F. T. MAPPIN, Bart., M.P., in the chair.

The GENERAL MANAGER and SECRETARY (Mr. Hanbury Thomas) having read the notice convening the meeting, the report of the Directors, which was summarized in the "JOURNAL" for the 18th ult., was taken as read.

The CHAIRMAN, in moving the adoption of the report, referred briefly to the resignation, through ill-health, of one of the Directors—Mr. J. W. Harrison—and then alluded to the loss the Company had sustained by the death of their Law Clerk (Mr. W. Wake), whose ability and experience had for a period of more than fifty years been of great service to the shareholders of the Company. Along with his family, they felt Mr. Wake's loss greatly; and he was sure the town also had lost a very important and intelligent citizen. The statement of accounts which the shareholders had received showed that the Company had not made sufficient profit during the past half year to pay the full dividend; and they had to take £3802 from the balance brought forward. This would leave £3957 to be carried into the present half year's accounts. The sale of gas had increased to a limited extent. Only 3,336,000 cubic feet were supplied more than in the corresponding half of 1895. The demand upon this latter period, it would be remembered, was very heavy, and was greatly increased by the severe weather. The current half year, he was pleased to say, showed a greatly augmented consumption. The increase since July 1 had been more than 30 million cubic feet—equal to 12·32 per cent.—which he believed was the largest he had known in any similar period since he had been associated with the Company. The balance-sheet was affected favourably by £2152, while coal and carriage had cost less than in the corresponding half of last year. This was apparently the only favourable feature on that side of the accounts. The sales of gas had realized £3940 less, caused by the reduction of 2d. per 1000 cubic feet in the price. They had also received £1283 less for coke and £2506 less for sulphate of ammonia. Over these two items, they had no control; and the cause of it he proposed to refer to as he proceeded. The reserve fund was at its maximum—being £86,192; and they had only spent £3651 on capital account, after deducting £1310 for land sold, and £891 for depreciation of meters and stoves. During the ensuing six months the expenditure would be considerably increased on account of the progress of the works at Grimesthorpe. Tests to the number of 1211 had been made during the past half year; showing the average illuminating power of the gas to have been 17·71 candles. The leakage had been 54 million cubic feet, as against 46 millions in the corresponding period of 1895. The cause of this increase was not easily to be explained; but a fortnight previously he saw men at work on a road, and detected a great escape of gas. He went the following morning to see if the place of escape had been discovered; and he was told that the men, after working until five o'clock in the morning, had discovered a broken pipe in the middle of the road. Circumstances like these would account, with the very large mileage of pipes which the Company possessed, for the increase in the leakage. They had fixed during the past half year 315 gas-fires, 320 stoves, and 30 gas-engines, against 20 gas-engines in the corresponding period of 1895. The gas consumed by these engines, which in 1893 was 33 million cubic feet, had during the last twelve months been 66 millions. He was not, however, satisfied that manufacturers and others fully appreciated the advantages to be derived from these motors. He had before him a list of the various purposes for which they were employed, and he might mention that it included driving lathes, sawing wood, electric lighting, driving mortar-mills, chopping hay, pearl cutting, file cutting, ventilating, bottling, electro-plating, and a number of other purposes which it was not necessary for him to enumerate. He anticipated that, as people understood the advantages of these engines better, more of them would be used; and he hoped that Sheffield would begin the manufacture of them as well as of steam-engines. He would now refer to the cause of the great reduction the Company had experienced in the price of the residuals they manufactured. Sulphate of ammonia produced them, for every ton of coal carbonized in 1894, 2s. 10d. per ton. In 1895, this was reduced to 1s. 8d. per ton; and in 1896, to 1s. 6d. per ton. Why did these great reductions occur? His opinion was that it was because of the very large and extensive stocks that were kept by the most important Gas Company in England, and by their blundering and bad management. He believed that all connected with the gas industry suffered greatly by that Company's mismanagement. The Chairman of another Gas Company the other day said that The Gaslight and Coke Company had an opportunity of disposing of their large stocks of coke at 10s. a ton last September and October, but that in January they had to reduce the price to 9s. 9d., and in July they accepted 9s., and were selling a large quantity at as low as 8s. He would give the shareholders some indication of what these large stocks were, for he thought the London Company should be told plainly what was thought of their management. The Gaslight and Coke Company's stocks on June 30, 1893, were 14,000 tons of breeze and coke. In 1894, they were 23,000 tons; in 1895, 97,000 tons; and in 1896, 203,000 tons. Was that good business or bad—good management or bad? Then, in reference to tar and ammoniacal liquor and other products, in 1893, according to their own accounts, the Company's stock was £49,000 in value. In 1894, it was increased to £111,000; in 1895, to £204,000; and in 1896, to £249,000. This was the cause of their having to accept such small prices for residuals. Buyers knew these large stocks were there, and that they were held by people who were anxious and had to get rid of them, and so other companies had to accept the market value thus fixed; and although sulphate of ammonia contained 25 per cent. more ammonia than nitrate of soda, it was selling at a lower price than nitrate at the present time. How were the London Company fixed so far as their balance-sheet was concerned? They had made no reduction in the price of gas. Their price was 2s. 10d. per 1000 cubic feet; and their dividend in January, 1896, was short by £92,680, and they took this out of their previous balance. In June, 1896, they had also to take £55,224 out of their previous balance. The Company might well be short of paying their dividend when such management as he had described took place. The Company were now asking for increased capital to the extent of £150,000. He would not further comment on this subject; but he did think that pressure should be brought to bear by the proprietors of the Company to see if some different management could not be effected. Shareholders in the Sheffield Company were no doubt anxious to know if the gas industry was progressing as it had hitherto done. He believed it was, in spite of its powerful antagonist electricity. In 1895, there were 3274 million cubic feet more gas sold than in 1894; the capital of various gas undertakings was increased by £1,750,000; and the profit made was equal to 8·1 per cent. upon the capital. Its antagonist, electricity was no doubt fairly prospering, for he saw in the publication called "Lightning" that the capital invested in electric lighting was £6,470,000. The receipts were £692,000; and the profit, £315,000, equalled 4·87 per cent. on the capital employed. The Corporation of Sheffield had not possession of the electric lighting industry; but the Nottingham people had. Nottingham had put down one of the most modern and best-equipped works in the kingdom. It had been down for rather more than two years, and had cost the town £53,700. A comparison was made last year by 86 consumers who had the electric light laid on and used for a clear year. These consumers had previously paid for their gas during the twelve months £3215. The following year, their gas bill was reduced to £2336; but their electric lighting bill came to £2386; or altogether, for the year, £4722. Consequently gas costing users £879 was replaced by electricity which cost £2386. Therefore, the estimate they had heard made as to the difference in the cost of electricity and gas had been pretty well maintained, and showed that electricity was 2·71 times as dear as gas. Before he sat down, he would just refer to one subject, not as the Chairman of the Sheffield Gas Company, but as a citizen interested in the progress of Sheffield and its good management and government. The Corporation had become possessed of the tramways, and a Sub-Committee had been appointed to investigate how and where the best system of propelling cars on different tramways was to be found. They would be expected to give a good report, which he was sure would be a very responsible duty upon any citizens to make, for it was a difficult subject. What they wanted in the first place was to arrive at what was the most efficient and suitable mode of traction for the gradients and widths of streets and the routes they had in the city. They wanted a safe and not a dangerous arrangement; so that the lives of citizens might not suffer as they had done in many cities and towns in the United States. The system must be proved, in his opinion, to be a commercial success; for unless it was, they would not be able in future to carry the people at a small cost—and that was a very important thing. He would regret very much to see tramways put down in Sheffield that would deprive the people who had to go long distances of the privilege of being carried for a low fare. He had read with much interest a short reference in regard to the tramways of Sheffield in the "Electrician" for Sept. 4 last. The writer said: "The Committee has been inundated with recommendations and proposals with regard to the future mode of propulsion; but the electric system is most in favour with the Committee and with the community. The popularity of the electric system may possibly be due to the fact that it is least understood by the public." That was from the "Electrician." The same publication said: "There is, of course, no doubt as to the suitability of electric power for taking cars quickly up gradients; and possibly full reliance may be placed on the system of brakes for letting the cars go safely down. Electric traction *per se* is, of course, an accomplished fact; but the Committee, which has undertaken a great responsibility in this connection, has to carefully inquire whether electric traction, with its conductors, either overhead or underground, can be used on the local gradients in a commercial sense. That is to say, whether it will pay with the fares at low rates, and even, if so, whether such system is more reliable and cheaper than the cable or any other improved method of traction." Well, there were other modes of traction besides electricity; and in Paris they were experimenting on the Gas Traction Company's cars, with the following results: Horse power per car, 12 to 15; number of passengers per car, 42; weight of car when empty, 7 tons; weight when full, 10 tons; gas used per car-mile, 31·1 cubic feet; maximum speed, 10 miles an hour; longest run without re-charging with gas, 14 miles; cost, with gas at 4s. 6d. per 1000 cubic feet, 1·306d., or less than 1½d. per mile. With gas in Sheffield at less than half the Paris price, the cost, if gas traction were adopted, should be under 1d. per mile. The same Company had commenced running gas-driven cars between Blackpool and St. Anne's. There were at present two cars on the line; but these would be increased to twenty before next season. The Sheffield Gas Company had sent an officer over to Blackpool to see how this mode of traction was managed; and it appeared to be most satisfactory. He believed that the Sheffield Corporation Sub-Committee ought to go and see all the places where traction for tramways had been made a success; and he trusted, whatever their decision might be, that it would be for the benefit of the city at large—not for any particular company, but that the people might be enabled to be carried safely and well by the tramways of this great community. His last word was to ask consumers to pay attention to their burners and their pipes and fittings. It was surely worth some little trouble and expense to have the best light; and as improvements were taking place daily, not only in burners but in globes and other appliances, he was sure it was well for all who were desirous of having the best light for the least price, to see what was being done by the gas world in this direction.

Mr. H. HUTCHINSON seconded the motion; and it was carried unanimously.

The dividends recommended by the Directors on the various classes of stock having been declared,

The retiring Directors (Sir H. Stephenson, Mr. E. Hall, and Mr. W. Mappin) were re-elected.

Mr. Hanbury Thomas, the General Manager of the Company, having been appointed also Secretary, in succession to the late Mr. Wake, was voted an annual remuneration for the duties of his new office.

A vote of thanks was accorded to the Chairman for presiding; and a similar vote to Mr. Thomas and the staff, which was very cordially passed, concluded the business.

HUDDERSFIELD CORPORATION GAS AND WATER SUPPLY.

At the Meeting of the Huddersfield Town Council last Wednesday, the Finance Committee submitted a statement, prepared by the Borough Accountant, as to the cost of the reconstruction of the gas-works in Leeds Road. The total was £96,392; and of this amount the Gas Engineer and Manager (Mr. W. R. Herring) estimated that £76,349 was fairly chargeable to renewals account, and the balance of £20,043 to capital expenditure on the reconstruction scheme. The time occupied by the work of reconstruction was three years; and during this period £16,398 had been expended and charged to capital account in respect of works and mains. With regard to the sinking fund, the Borough Accountant stated that the period allowed for the reduction of the debt was sixty years from the time of borrowing; and the amount of specified borrowing power authorized by Local Acts for gas-works purposes was £350,500, of which there was still £28,664 available to meet further capital outlay. The statement was approved of.

At the same meeting, the Chairman of the Water Committee (Alderman Crosland) furnished some interesting statistics as to the water-works. He said that the daily supply at present was 5¼ million gallons; but, taking a term of years, the average was 4¾ millions. Of this quantity, 2,194,875 gallons went for domestic consumption, and 1,766,000 gallons for manufacturing purposes. Up to the present month, £131,289 had been expended on the Butterley reservoir; and the Water Engineer (Mr. Crowther) estimated that another £50,000 would have to be spent on the reservoir, which was expected to be completed at the end of 1898. When it was completed, it would give a supply of 3½ million gallons per day; and it was intended that of this quantity 1¼ million gallons would go for domestic purposes, and 2¼ millions for compensation to the valley. The Corporation, he continued, had bought the whole of the Wessenden Valley for water-works purposes for £50,000; and he thought it would be advisable to start the construction of the proposed Blakeley reservoir at an early date. This reservoir would cost £35,000, and would hold 80 million gallons.

THE WATER SUPPLY OF EAST LONDON.

"Indignation Meeting" at Mile End.

Last Tuesday evening, a public meeting, organized by the London Reform Union, was held in the Great Assembly Hall, Mile End, for the purpose of condemning the conduct of the East London Water Company in respect to the recent curtailment of the supply of water in their district, and of urging the establishment of a municipal water supply for London. Sir S. MONTAGU, M.P., occupied the chair; and upon the platform were Mr. E. H. Pickersgill, M.P., Mr. J. Lowles, M.P., Mr. C. Harrison, M.P., Mr. W. H. Dickinson (the Chairman of the Water Committee of the London County Council), and other gentlemen who have identified themselves with the water question in London. Mr. S. Buxton, in the course of a letter apologizing for not being present, said: "Two points are obvious. First, that the control of the supply of water must be taken out of the hands of the private Companies and placed in those of a really representative body. The interest of the shareholder and of the consumer must cease to be antagonistic. Secondly, that failing this, and pending this, something should be done at once to prevent a Water Company being entitled to exact its full water-rate if on its part it only performs a portion of its obligation." Mr. Charrington, M.P., wrote expressing his opinion that the only remedy was to be found in additional sources of supply; Mr. Holland, M.P., declared that he was entirely in favour of the ownership of the supply being vested in a public authority; and Mr. Samuel, M.P., cordially agreed that legislation for the purpose of obtaining control over the action of the Water Companies was absolutely necessary. Sir A. Arnold, the Chairman of the London County Council, wrote: "I am convinced that the acquisition of the Water Companies' undertakings is a necessary and inevitable preface to a reform of the water supply of the Metropolis; and I am hopeful that the London County Council may, in this recess, make satisfactory arrangements with Her Majesty's Government for the progress of measures to this end in the next session of Parliament."

The CHAIRMAN, in opening the proceedings, said the water question was not a party one, and all should be able to unite in dealing with it. London was the only great town in which this question had not been settled; and the whole country must marvel at the extraordinary patience of Londoners. They were all agreed that the supply from the East London Water Company had been shamefully managed; and they ought to be made to suffer for their breaches of contract. Householders were told they would get a constant supply if they paid their rates; but the water was often cut off when the rates were paid. They ought to combine and refuse to pay for the water they had not received. There was one charge the Company could not refute, and that was that they did not apply for assistance from the New River Company until questions had been asked in the House of Commons. Had they asked for this help three months earlier, they would have kept the reservoirs full; and had pressure been put on the contractors, the additional reservoirs would have been ready for storage purposes. It was absurd to expect cisterns to be put into the homes of working men; and, if they were, there would be danger to health. No matter at what cost, the Company should be bought out; for he was informed that there was a great waste owing to leaky mains.

Mr. E. H. PICKERSGILL, M.P., moved the following resolution: "That this meeting declares it to be a grave public danger that the monopoly of supply to London of such a necessary of life as water should continue in the hands of private companies; and, in view of the failure of the East London Water Company to maintain an efficient supply, and of the certain recurrence of still more acute and general water famines in London as population increases, this meeting is of opinion that new sources of supply are urgently needed. This meeting therefore calls upon Her Majesty's Government to take steps in the ensuing session to constitute the London County Council, as the representative municipal body, the Water Authority for London, with full power to provide new supplies and to purchase the systems of the existing Companies on fair and reasonable terms."

Mr. J. LOWLES, M.P., in seconding the motion, felt certain that the majority of the members sitting on the Conservative side of the House would support any movement that would bring about an alteration in the present condition of things; and it was the duty of the Government at once to deal with the question.

Other speakers followed; and the motion was carried unanimously.

Mr. A. SMITH then moved: "That this meeting protests against any attempt to reimpose a system of storage cisterns, with an intermittent supply, as dangerous to the public health, and insists on the right of East London to a reliable, constant, and pure supply of water."

Mr. W. C. STEADMAN seconded the motion; and it was carried.

The Secretary of the East London Water Company (Mr. I. A. Crookenden) on Thursday sent the following letter to "The Times" in regard to the proceedings at the above meeting:—

The attention of my Directors has been drawn to the report of the meeting held on Tuesday by the London Reform Union; and they instruct me to state that they will feel obliged if you will permit them to remind your readers that nearly the whole of the accusations brought against the Company at that meeting are merely a repetition of those inquired into, and disposed of, by the Inspectors appointed by the Local Government Board, who held a public inquiry at the Hackney Town Hall last year. My Directors took the precaution of forwarding to the Hon. Secretary (Mr. Shillington) a copy of that report, with a letter declining his invitation to the Secretary to be present at the meeting. They would suggest that it is to be regretted that that report was not placed in the hands of Sir Samuel Montagu; for it would appear that he had forgotten that this Company's Bill to construct more reservoir storage capacity was rejected by the House of Commons in 1893, and only passed by a majority of one vote in 1894, upon which occasion he (Sir Samuel Montagu) and the other members of Parliament present voted against it. My Directors submit that the transition from the position then taken to that of now blaming the Company for not putting pressure upon the contractors to make the reservoir ready for storage purposes is palpably unjust and inconsistent; and they further defy him to instance a case where works of such magnitude have been constructed in so short a time as these have taken, the providing of which he opposed, but now so urgently demands. Taking into consideration that these assertions were made by public men responsible to the House of Commons, and believed in by their hearers, my Directors have felt it necessary to at once protest against such statements. My Directors cannot close this letter without bearing testimony to the almost uniform goodwill and sympathy exhibited by the great mass of the consumers under circumstances of unavoidable trouble and inconvenience.

LEEDS CORPORATION WATER SUPPLY.

Local Government Board Inquiry—Extensions of Works.

Last Tuesday, Mr. RIENZI WALTON, M.Inst.C.E., one of the Inspectors of the Local Government Board, held an inquiry at the Town Hall, Leeds, in reference to an application by the Corporation for power (among other things) to borrow £150,000 for water-works purposes.

The TOWN CLERK (Mr. J. Harrison), in addressing the Inspector in support of the application, remarked that it afforded him great satisfaction to say that, so far as he could see, there would be no opposition. The population of the city, according to the last census, was 367,500. They believed it was now increased to upwards of 400,000. The rateable value, for the city rate, was £1,420,366; and their area was perhaps the largest of any city or town in the kingdom—being 21,572 acres. Their total rates of a municipal character came to 5s. 10d. in the pound—of course, not including the poor-rate; and it might interest the Inspector to know that 1d. in the pound on the rateable value produced £5918. In their water-works, the Corporation possessed a most valuable commercial undertaking, which they acquired as long ago as the year 1852. Since then they had provided a magnificent system in the Washburn Valley, and had constructed storage reservoirs, pumping-stations, filtering-beds, and other works, and laid mains, representing a total expenditure of £1,825,000. So great had been the development of this concern, that he had received instructions to apply to Parliament during the next session for power to make further reservoirs in the upper reaches of the Washburn, and other matters in connection with the undertaking. The water undertaking was not only a very large one from the capital point of view, but it was a most profitable one; their profits for last year being £11,413, after paying interest and making provision for the redemption fund. They had added a large sum to capital from the reserve fund; and they had a reserve from profits at present amounting to £22,626. In 1887, the average consumption of water per day was 11 million gallons; now it was 15 millions. They had not had a Local Government Board inquiry in respect of the water-works since Oct. 4, 1892, when they obtained sanction to raise £100,000. Subsequently, they applied to have the term of repayment enlarged; and the Board acceded to their request. Thereupon the first sanction was cancelled, and the new one was given on Aug. 20, 1894, for £78,080. Upon that application being made, they paid from their reserve fund to capital no less than £37,000. This was upon the Eccup reservoir reconstruction expenditure; and it was upon that condition, among others, that the term for repayment was extended. The present application was made on Sept. 4, 1895, for £100,000; and on July 1, 1896, the Corporation decided upon an additional application for £50,000—making a total of £150,000. The reason they increased the amount was that, the inquiry not taking place until the present time, they had completed another year, and were able to show their expenditure to a later date; and so they applied for a further sum covering expenditure up to the end of the financial year in March, 1896. What they were applying for was really not new borrowing power, but only sanction for borrowing what had been previously authorized by Parliament. There was a balance of £21,920 under their Provisional Order of 1888. They had an Order of a similar character in 1883 for £100,000. The Order of 1888 was in

the form of increasing that £100,000 to £300,000; and the £21,920 he had mentioned was a balance of the £200,000. Then there was a balance of £128,080 under the power granted by the Leeds Improvement Act, 1893, section 83, "(2) for water-works purposes, £250,000." The same section provided that the Corporation should not borrow under that authority except with the sanction of the Local Government Board; and this was the first application under that authority. On the 11th of June last, the Corporation forwarded to the Board a statement of their position up to the end of the financial year—March 25, 1896. At the time they made the application, they were in the happy position of being within the expenditure previously authorized; so that anything they had done in the way of going beyond the sanction had arisen out of the fact of one year's delay since their first application. There was an item of £30,433 for the Harehills new reservoir. This was included in the last sanction. They had not spent the money. They had, in fact, changed the site of the proposed reservoir; and on May 15, 1896, they received a letter from the Local Government Board, agreeing to the substitution of the new site, and the use of the money authorized by the sanction of November, 1892, and August, 1894, to the purchase of the new land and the construction of the new reservoir. He wished to make a little explanation in regard to the first item on the account for the Eccup reservoir reconstruction; and the result of that explanation would be that he would ask to reduce the amount of the sanction by £24,520. Some time ago, a statement had been sent explaining this matter; but in calculations subsequently, they had omitted to give credit for a balance of £24,520 of a former sanction. The work of reconstruction at Eccup was very much greater than they at first anticipated, and was of such a character that it must be continued without a break. They had acted under the advice of Mr. G. H. Hill, of Manchester, in addition to the effective work of their City and Water Engineer (Mr. T. Hewson, M.Inst.C.E.); and necessity was laid upon them to do this work in a most complete manner. This matter had been fully reported to the Local Government Board from time to time; and so well had the Board understood it, that when the Corporation obtained sanction on Aug. 20, 1894, for £29,592, it was entirely in respect of work then done. The Board, of course, quite appreciated the fact that the nature of the work was such that the Corporation could not foresee what would be their future expenditure. The outlay on the extension of mains was an item that they could not estimate with very great confidence. Their average annual expenditure on mains for three years was £3438; and they were asking for a less sum than would carry them over three years. As to the item, Washburn 30-inch main, No. 3, it might be better to give an explanation on this point. At the time they commenced its construction, they had two mains from the Washburn; and they were horrified to find, just about the time that they commenced the third one, that both these had burst at one time by stress of weather, and they were in the further difficulty of having their large storage reservoir at Eccup empty—the one which was in process of reconstruction, and which was upwards of 200 acres in extent. They were therefore under the necessity, for the continuance of the supply of water, to commence this work at once; and he might be permitted to say that, by the resolution of the Chairman of the Water Committee, and by the activity of the Engineer, they tided over what might have been a most serious matter in the stoppage of supply for the whole of the city.

Some details were furnished by the Engineer with reference to the Eccup reservoir, the Washburn main, and other points, and the inquiry in respect of the water-works closed.

THE WATER SUPPLY OF MID-SUSSEX.

The Proposed Purchase of the Mid-Sussex Water-Works.

As briefly recorded in the "JOURNAL" for the 8th inst., Mr. G. W. WILCOCKS, M.Inst.C.E., has, by direction of the Local Government Board, held an inquiry at Cuckfield respecting an application by the District Council for consent to purchase the undertaking of the Mid-Sussex Water Company. The Council were represented by Mr. Boxall; and the Company by Mr. Robus and Mr. F. W. Dobson, the Chairman and Secretary respectively. It was explained by Mr. Boxall that the parishes of Ardingly, Balcombe, Bolney, Cuckfield, Cuckfield Rural, Haywards Heath, Lindfield, and Slaugham, which were within the limits of the Company, came also within the area of the Council. The population of these parishes was 12,665 in 1891; and they were increasing. The water supply depended at the present time on the Company, so far as any public supply was concerned. The Mid-Sussex Water Act of 1890 dissolved the then Limited Company (which had existed under a Provisional Order of 1888), and incorporated the present Company. Under section 55 of the Act, the period for the completion of the works of the Company was five years; and the powers therefore ceased on July 4, 1895. No works of any description whatever had been commenced or carried out in any parish outside the Cuckfield district, with the exception of North Wivelsfield. By section 51 of the Act, the Company were also empowered to construct a service reservoir in the parish of Cuckfield; but this had not been undertaken. Provision was also made for the laying of certain pipe-lines, which had not been done; and consequently the parishes of Ardingly, Bolney, and Slaugham were left entirely without a supply of water. Even the supply for Lindfield was very partial. Replying to the Inspector, Mr. Robus stated that Lindfield was about 9 miles from the source. Mr. Boxall further alleged that other places had experienced great difficulty in getting a supply; and the Company were imposing onerous terms. From the first statement of accounts—February, 1891—it would be seen that the "cost of construction of works, Special Act, and expenditure to date" was £29,517 14s. 11d. The cost of the construction of the works was £17,184 18s. 6d.; so that the cost of the "Special Act and expenditure to date" was no less than £12,333. The Company appeared by this to have started fairly handicapped. Looking at the last balance-sheet, it would be seen that the borrowing powers were not only exhausted, but so far as he could see, they appeared to have been exceeded. Owing to certain complaints, the Council decided to make the present application, and resolved that the expenses should be a special charge upon the district to be supplied. An attempt had been made to enter into negotiation with the Company, with a view of agreeing upon some price at which the undertaking could be bought; but at present no arrangement had been come to, as the Company wanted too much. They declined to sell, and apparently over-estimated the value of the undertaking. The Act gave any local authority in the district power to purchase after the completion of the works authorized. He suggested that the reasonable interpretation of the words "after the completion of the works" was after the works had been completed within the limit of time, or if the limit of time had been allowed to elapse. Evidence was then called to bear out Mr. Boxall's statement. Questioned by Mr. Robus, the Surveyor of the District Council (Mr. W. Beach) stated that, in his opinion, if the supply was in the hands of the Council, the mains would be extended in every direction where they were wanted. Mr. C. O. Blaber, an Engineer, who had made an investigation of the Company's affairs, stated that in the balance-sheet the following figures appeared: Original share receipts, £27,920; debentures, £5325; provisional obligations, £17,600—making a total of £50,845. The balance of capital account—£765—made a total of £51,610. The site of the works was at Balcombe; and they were situated on about 1¼ acres of land. The well was 300 feet deep; and its yield 100,000 gallons a day. The machinery consisted of a high-pressure engine of 20-horse power nominal, two Cornish boilers, one set of three-throw pumps (capable of delivering 16,000 gallons per hour), a donkey pump, and a Roots steam blower. There was a filter-bed of about 500 yards square, of which 160 square yards were completed; and a reservoir of 300,000 gallons capacity, built under the Provisional Order of 1888. About 834 tons of pipes had been laid of from 12 to 3 inches diameter—the total length being 15 miles. Mr. Robus observed that the measurement of the pipes was 21 miles; and he elicited from witness that he was the Engineer of the scheme which was put forward in opposition to that of the Company. Mr. Robus also stated that 150,000 gallons of water had been pumped from the well in 24 hours; and Mr. Blaber agreed that there was plenty of water to be obtained from the Company's works. It was also contended by Mr. Robus that the covered reservoir had a capacity of 500,000 gallons. Proceeding, he submitted that, under the Company's Act, the inquiry was not to the point. The first thing the Council should have done was to have applied to the Company to know if they were willing to sell. They were not compelled to sell under the terms of the Act. All the works and mains referred to in the Act had not been put down. The section said "after the completion of the works authorized by this Act of Parliament." In the Provisional Order, there was no compulsory clause to purchase; and all the works were done under the Order. He said this to protect the Company should the matter come to arbitration. With regard to the extension of the mains, it had been said that many complaints had been made about the working of the Company, but he could only speak on hearsay. With regard to the complaints of the Council, the remedy was in their own hands. If they offered 10 per cent. on the outlay for extensions, the Company were bound to lay the mains; but no such offer had been made. He had driven over the whole of the district where their mains were laid, and he found from 600 to 800 houses along the line of main that did not take the water. He supposed this was because the people thought they would get better terms from the Council than they would from the Company; but he very much doubted it. Mr. Robus added that, though the Company had no desire to sell, if the Council made a fair and reasonable offer, it should be brought before the shareholders. At the conclusion of the inquiry, the Inspector, with the representatives of the various interested parties, visited the water-works.

WATER SUPPLY BY METER.

The paper of which the following is a digest, was contributed by Dr. F. Lux to the "Zeitschrift des Vereines Deutscher Ingenieure." It is stated on the authority of the "Journal für Gasbeleuchtung," that of the total of about 45 million tons of water supplied annually to Berlin, about 4 million tons are unaccounted for. A loss of this magnitude becomes of considerable importance to a water undertaking which, according to the very prevalent system on the Continent, charges for the water supplied according to the meter registrations. Dr. Lux has therefore set himself the task of grappling with the chief source of the loss—viz., the water-meter, which, under certain conditions, allows water to pass unregistered.

It is an inherent fault of water-meters of the rotatory wheel type that water flowing at a rate below a certain minimum for each size of meter passes through them without registration. For a variable rate of flow, a large and a small meter are frequently fixed side by side on the same supply; and an automatically active valve is placed before the meters to shut out the large meter when the rate of flow falls below the minimum at which it gives a correct record of the quantity passing through it. When the supply required is either constantly large or constantly small, this arrangement acts well; but when, as in most cases, it varies irregularly, numerous instances must occur in which the valve is slightly open and small quantities only pass through the large meter, and so escape measurement. There are difficulties in the way of the automatic preclusion of rates of supply covering the zone for which the meters are thus inefficient; though the attempt has been made to cause the whole of a small quantity to pass through the small meter, and all of a large quantity to pass through the large one.

Three fundamental types of valve are applicable to the automatic regulation of the supply to each meter. They are controlled respectively by a weight, a spring, or by hydraulic pressure. The first or balance valve is the simplest, and consists merely of a plate held down by its weight on a horizontal seat, until the difference in pressure on its two sides forces it to open and allow water to pass. This valve acts solely through difference in pressure, and is independent of the absolute pressure of supply. The difference is constant to whatever extent the valve may be open. The spring valve is closed by the tension of a spring, which increases as the valve opens; and therefore the difference

in the pressure on the two sides must vary with the extent to which the valve is open. It is, however, independent of the absolute pressure. In a vertical position, the spring valve combines the principle of the balance valve with that of the simple spring valve; and the constant difference in pressure of the former type is modified by the increasing difference of the latter. The pressure of the water is the closing force with the hydraulic valve; and the difference in pressure on the two sides of the valve is therefore directly proportional to the pressure before it. Combinations of any two or of all three types of valve are possible.

The balance valve is simple and durable; but the right-angled bends necessary before and after it, cause a loss of pressure to the supply. This loss of pressure is quite independent of that due to the working of the valve, which is comparatively low with this type. For this reason, the valve opens and admits water to the large meter too readily. The spring valve needs no change of direction of the pipe, and causes little loss of pressure. The pressure of the spring increases, however, with the quantity of water passing, and is liable to fluctuations. Steel springs rust rapidly in contact with the water; and springs of other metal lose their elasticity. The hydraulic valve throws a pressure diminishing with the quantity of water passing, and hence is best where large quantities are needed for quenching fires.

Tolerably correct registration may be obtained if a hydraulic valve chosen to suit the supply is used. One tap will pass from 110 to 260 gallons per hour; and for the whole of this to go through the small meter, the valve should not open the way to the large meter until the rate of flow is 260 to 330 gallons per hour. With a flow of about 175 gallons per hour, a balance valve would probably let 130 gallons through the small and the remaining 45 gallons through the large meter. If the latter is about 3 inches in diameter, most of the 45 gallons would escape registration. The spring of a spring valve would weaken by degrees, and small quantities of water would gradually be passed through the large meter unrecorded. On the other hand, a hydraulic valve selected to meet the requirements of the particular case would retain its efficiency unaffected; but when it was open to a very slight extent, a small quantity of water might find passage through the large meter without being registered. The valve should therefore, when it opens, open sufficiently far to allow a quantity that the large meter will register accurately to pass to it.

Herr Thiem has devised a valve to shut out the large meter when the flow is small, and opens to the large, but shuts out the small one when the flow is considerable. It is a combination of a weighted with an unweighted valve; and the difference in pressure on its two sides is independent of the pressure of the supply, and is practically equal to about 12 inches. The lower outlet is about three times the size of the upper one, and consequently, when the valve rises, the upper orifice is diminished by a certain amount, while the lower one is increased by three times that amount. The total section of the outlet is thus increased; and the difference in pressure is lessened. The upper cavity is therefore not shut out suddenly, but gradually. The only advantage that the Thiem valve possesses over the balance valve is that, with a fair flow of water, the whole of it passes through the large meter. The small meter is shut out, and the measuring power of the whole apparatus thus diminished by 5 to 10 per cent. If the upper opening be enlarged until it is equal in size to the lower one, the valve becomes inoperative, and has no tendency to either lift or fall. These valves are difficult of manufacture, as both the casing and cover serve as guiding surfaces. To avoid jamming, much play must be allowed; and consequently water can force its way through to the upper opening, and escape registration.

This valve therefore fails to completely solve the problem, the conditions of which are, however, fulfilled by the differential valve which may be of either of the three primary types. The valve projects over its seat, and is guided from a cylinder within the seat itself. So long as the valve rests on its seat, the projecting surface has no effect, as the pressure on both sides of it is equal. But so soon as the difference in pressure on the two sides suffices to lift the valve, its whole area comes into play; and it is at once pushed out from the guiding cylinder. The difference in pressure on the two sides is greater when the valve is closed than when it is open. By properly proportioning the areas of the inner and outer surfaces of the valve, it is quite possible to provide that the smallest quantity of water which goes to the large meter is one that it can measure exactly.

As an example, the dimensions of the valve on a 1·97-inch service, with the larger meter of the same diameter, and with a mean pressure of 105 feet, were calculated. The smaller meter was a 0·6-inch one; and the difference of pressure was about 10 per cent. of the mean pressure. The small meter at that difference would pass 330 gallons per hour. The large one registered under 110 gallons per hour correctly, and therefore 440 gallons per hour should go through the small meter before the valve opened, which required a difference of pressure of 16·5 feet. The inner diameter of the valve-seat being 1·97 inches, and the width of the annular seat being 0·079 inch, the piston should be 0·79 inch wide, and the valve 2·48 inches in diameter to meet these conditions. An apparatus constructed to these dimensions proved their correctness on trial, and behaved excellently.

This demonstrates that the construction of apparatus for measuring water, if pursued on rational lines, may be perfectly successful. In some cases it will be found desirable to use three meters of different sizes in conjunction on one supply.

Cooking by Gas in Public Institutions.—Some weeks ago, we referred to the satisfactory results attending the introduction of cooking by gas at the Lewes Workhouse; a saving of £10 per annum being effected in the cost of fuel. The stove which elicited the commendatory remarks of the House Committee of the Lewes Guardians was Messrs. Richmond and Co.'s "Strand" double cooker, obtained through the Lewes Gas Company, and by its economical working it will pay for itself in eighteen months. As an indication of the increased favour in which gas is held for culinary and other purposes in asylums, it may be mentioned that Messrs. Richmond and Co. have secured the order to supply two of their largest "Model" ranges, with all the latest improvements, to the Joint Counties Asylum, Carmarthen.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The meeting of the Incorporated Institution of Gas Engineers in Glasgow this week must have proved a very profitable gathering to those who assembled. Most of those who were present had journeyed long distances to inspect the Glasgow Corporation Gas-Works in operation. This they were able to accomplish; and it must have been a pleasure to all to see the high state of efficiency to which Mr. Foulis has brought the establishment under his charge. It is to be regretted that the weather was very unpropitious, because the comfort of everyone was greatly marred by the wind and rain. The Institution, I may say, is not a popular body in Scotland. I only know of one or two members who hail from this part of the United Kingdom. It is the rival body which is favoured by Scotchmen, for what reason I cannot say. Possibly the restriction in the title of the Institution to engineers may have something to do with Scotchmen standing aloof. It is a state of matters for which, in a free country, neither merit nor demerit attaches; but so long as it exists, it gives the Institution a one-sided aspect, and, to a large extent, deprives Scotland of whatever benefit might be derived from connection with the Institution. On this occasion, the proceedings took the form of a visit by engineers from England to the foremost gas-works in Scotland, for the purpose of obtaining instruction. Scotch gas managers have, thanks to the generosity of Mr. Foulis, already visited the works which were shown to the members of the Institution. There was therefore less reason for their attending, even though they had been members, than there was for the gentlemen from the South, many of whom are themselves making great strides in the way of improving gas plant, and to whom the sight of what has been done in Glasgow must have been refreshing. Scotland was represented at the meeting by the works; and Scotchmen are pleased to think that they have been able to lay down plant which it was worth the while of so many to come so far to see.

It was a coincidence that only a few days prior to the visit of the members of the Institution to the Tradeston works, John F. Kearney, who was the principal of the gang who attempted to wreck one of the gasholders in the works by dynamite, on the night of Jan. 20, 1883, should have been arrested. This circumstance alone added interest to the visit to the works. It is almost needless to say that, though the members saw the place where the explosion occurred, there is now nothing whatever to indicate that ever anything unusual happened there. Probably the members were not aware of the amount of police surveillance to which they were themselves subjected when in Glasgow. Scotland is at the present moment, on account of the visit of the Czar and Czarina, bristling with police detectives and with Government spies belonging to our own and other nations. The Royal party are, on Tuesday afternoon, to undertake a railway journey from Leith to Ballater—a distance of 160 miles; and the arrangements for this journey include, besides the patrolling of the entire line by gangs of surfacemen within a few minutes of the passing of the train, and the watching by detectives of all points of approach to the railway, the stationing of a policeman at every bridge to be traversed. All railway stations, hotels, and public places are being closely watched; and it goes without saying that the members of the Institution came in for their share of observation. No one would suspect anybody connected with the Institution of having designs upon the gas plant in Glasgow. But it was possible, and by no means improbable, that if there had been loose management some miscreant might have taken advantage of the opportunity to walk along with the party for the purpose of spying out vulnerable points; and members will not be annoyed at the notion of precautions being taken to prevent this. In connection with the arrest of Kearney, it may be stated that, while he escaped at the time, his dupes were convicted. Three of them have been liberated; and of these, one has gone to America, but the other two reside in Glasgow. The police are satisfied that they have nothing to do with the present plots.

The Glasgow Corporation have contracted for supplies of splint coal for their gas-works for the period of six months from the 1st prox. The rates are said to be from 7s. 3d. to 7s. 6d. per ton delivered at Dalmarnock, and from 3d. to 6d. per ton extra for delivery at Dawsholm. These prices are about 9d. per ton over those which were agreed to last year.

At Gourock this week the Gas Committee of the Town Council reported that they had a substantial balance on hand from last year's working. They do not recommend any reduction in the price of gas to consumers within the burgh; but to those outside, it is proposed to lower the charge from 5s. 10d. to 5s. 5d. per 1000 cubic feet.

The Greenock Police Board have this week perpetrated a manifest blunder. When fixing the estimates for the current year, there was entered as the estimated profit from the gas-works the sum of £1000. To this sum two members objected, on the ground that the estimate of the Gas Committee was for a profit of only £178. The objectors were, however, silenced by Provost Shankland, who said that, considering the large amount of money invested in the works, and that the oil-gas process was going on smoothly, they were satisfied that £1000 of profit would be earned. It may be that the oil gas system may lead to increased profits; but of this the Gas Committee should be the judges. If they have not estimated for it, the Police Commissioners are overstepping their bounds in endeavouring to make the Committee disgorge profits which are not expected to be realized. On the other part of his remark, it is not quite apparent how the amount invested in gas-works should rule the profit. Tradesmen are accustomed to look for a certain return upon their investments, without which they could not live; but I never heard of this principle being applied to municipal gas undertakings, which are not worked for profit. The investment by the Greenock Corporation in their gas-works is at present about £90,000. A profit of £1000 is just a fraction over 1 per cent., which, if the Provost's view of the matter be right, is a very poor return. But the true return they should look for is in the cheapening of the gas; and while the Corporation cannot be charged with neglecting this object in the past, they would seem, by the arrangement which they have adopted, to have lost sight

of one of the best means of attaining further reductions, which is to work at as little profit as possible. A high profit is not only a direct loss to the undertaking, but, according to the present practice in the valuation of gas-works, it leads to an increase in the amount of the taxes which are levied upon the undertaking.

In Stirling, at the end of last week, a meeting of ratepayers was held, at which, among other subjects, the proposal by the Town Council to acquire the undertaking of the local Gas Company was considered. A resolution was unanimously adopted requesting the Police Commissioners, after ascertaining the cost of the undertaking, to submit the question of purchasing to a plebiscite of the ratepayers. In speaking to the motion, the gentleman who proposed it alluded to the advent of electric lighting as likely to affect the prosperity of the gas undertaking. He also argued that, on account of some gentlemen being both members of the Police Commissioners and shareholders in the Company, their position was liable to be misunderstood, if they were to be both sellers and purchasers; but if the matter were referred to the ratepayers, this difficulty would be disposed of. No exception can be taken to the tone of these remarks; but it is not a very hopeful way of promoting a transfer. A provisional price which might be satisfactory to the one side, would most probably be not so to the other, and would be almost certain to be rejected. There is, after all, something to be said for the statutory purchase, because under it, when the matter goes to arbitration, neither side can resile. The resolution was submitted to a meeting of the Town Council on Monday, when it was intimated that the wishes of the ratepayers, as expressed in the resolution, had all along been kept in view by the Council, and that when they received the report of their adviser the whole matter would be laid before the Council, and afterwards the ratepayers. The adviser to the Council is Mr. James M'Gilchrist, of Dumbarton. At the same meeting of ratepayers, a resolution was also adopted requesting the Police Commissioners to carry into effect, without delay, the obligation they had entered into under a Provisional Order to introduce the electric light into the burgh. This resolution was supported in the Town Council by a Councillor who considers that the pushing on of the one scheme would help the other; but the general feeling was against it, in view of the position which the proposed gas transfer is in.

In Perth, it is reported, there was an increase in the quantity of gas manufactured in the month of August as compared with the same month of last year, amounting to 613,900 cubic feet; and that, since May 1, the quantity of gas made has been 19,870,100 cubic feet, compared with 17,859,200 feet in the corresponding period of last year.

The Falkirk Gas Commissioners have resolved to ask the sanction of the Secretary for Scotland to their borrowing £15,000 for extension purposes at the gas-works. The loan is to be raised by means of the issue of Corporation stock. The proposal was made that the salary of the Assistant Manager should be increased from £109 to £125; and that two collectors should have their wages increased from 27s. to 30s. each. There was some discussion over these proposals, as being contrary to the policy of economy which had been boasted of a few months ago. The reply was the very interesting statement that, since the Corporation acquired the undertaking a year and a half ago, the number of consumers of gas had risen from 2800 to 3500, and that among the new consumers there were 400 who were supplied with gas through automatic prepayment meters. It was urged that, the work being now much greater, the workpeople should be better paid. The proposals of the Committee were agreed to.

The Magistrates of Cupar sat as a Valuation Court on Tuesday, but had only one case before them—that of the Cupar Gas Company, who complained of the value of £674 15s. which the Assessor had put upon their works. The Assessor explained that he personally was a believer in the method of valuing gas-works according to the amount of the capital outlay, but that he had no option in the matter—the Supreme Court having decided that the valuations should proceed upon the amount of profit earned in the preceding year. He valued the Cupar works upon this basis. The Solicitor for the Company submitted that the valuation was higher than were the valuations of gas-works in other towns whose profits were larger; and he asked that the profits for several years should be taken into account. The Assessor agreed to take £10 off the amount, which represented the rent of the Manager's house, and was part of the Manager's wages; and the Court fixed the valuation at £664 15s.

At a meeting of the Finance Committee of the Edinburgh and District Water Trust yesterday, a statement was submitted by the Treasurer (Mr. W. Anderson) showing the estimated expenditure for the year 1896-97 to be £91,217, and the revenue £91,313, calculated on the basis of the present rates, with the exception of a reduced domestic rate of 5d., instead of 5½d. per £. The Treasurer stated that, with a rate of 5d., and the progressive increase of revenue which might be expected during the next five years, the interest upon capital expenditure relating to the new works would be fully met; leaving at the end of that period an estimated surplus of over £7000. The sinking fund does not come into effect for the new works until the year 1905; and it is expected that the Talla supply will be introduced in the year 1901. The Chairman moved that the domestic water-rate should be fixed at 5d.—being ½d. less than last year. This was agreed to.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 19.

Sulphate of Ammonia.—There has been more demand for "covering" sales for September delivery; but the orders have, for the most part, been placed in Scotland, at £7 8s. 9d. to £7 10s. per ton f.o.b. Leith, and at the equivalent of these prices f.o.b. Glasgow. At the close, the Scotch production for the month being pretty fully sold, makers in Scotland are rather firmer. Hull and Liverpool markets, available supplies being small, have remained about stationary; the quotations being £7 11s. 3d. and £7 13s. 9d. per ton respectively. London has, however, had to give way in order to induce business—shipments from this point having been on a small scale of late; and the closing value is £7 12s. 6d. per ton f.o.b. Encouraged by prospects of ample supplies, "bears" are again offering abroad for near delivery at below the equivalent of spot prices, without inducing much business

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 542).

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Apl.	10½	Alliance & Dublin 10 p. c.	23–25	–2	4 4 0
100,000	10	"	7½	Do. 7 p. c.	18–19	..	3 18 11
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
200,000	10	12 June	5	Belgrano (B. Ayres), Limited	10–10⅛	–¼	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅞–8¼	..	3 18 9
40,000	5	"	6½	Do. New, £4 paid	5½–6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285–290	..	4 2 9
210,000	"	"	9	Do. New	215–220	..	4 1 9
50,000	"	"	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
159,375	"	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	242–247*	+¾	4 13 1
208,820	"	"	8½	Do. A Ord. Stk.	185–190*	–¼	4 9 5
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	27 Mar.	11¼	British	57½–58½	..	3 16 11
50,000	10	28 Aug.	11¼	Bromley, Ordinary 10 p. c.	22–23	..	5 0 0
71,000	10	"	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	29 Apl.	5	Buenos Ayres (New) Limited	10¾–11¼	..	4 8 11
200,000	100	1 July	6	Do. 6 p. c. Deb.	103–106	..	5 13 2
150,000	20	15 July	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	29 May	6†	Cape Town & District, Ltd.	16–17	..	3 10 7
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Apl.	13½	Commercial Old Stock	345–350	..	3 17 2
165,000	"	"	10½	Do. New do.	260–265	..	3 19 3
165,000	"	12 June	4½	Do. 4½ p. c. Deb. do.	152–157	..	2 17 3
800,000	Stck.	12 June	13	Continental Union, Limited.	287–292	..	4 9 0
200,000	"	"	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315–320	..	4 7 6
163,400	"	"	11	Do. B 7 p. c.	250–255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140–143	..	3 13 5
60,000	"	"	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
486,090	10	15 July	11	European, Limited	26½–27½	..	4 0 0
354,060	10	"	11	Do. £7 10s. paid	18–19	..	4 6 11
5,746,590	Stck.	13 Aug.	12¾	Gaslight & Coke, A, Ordinary	305–310	–8	4 2 3
100,000	"	"	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	"	"	10	Do. C, D, & E, 10 p.c. Pf.	305–315	..	3 3 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	147–152	..	3 5 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	212–217	..	3 9 1
1,300,000	"	"	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	305–315	..	3 3 6
476,000	"	"	6	Do. K, 6 p. c. Prf.	173–178	..	3 7 5
1,061,150	"	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	"	"	4½	Do. 4½ p. c. do.	153–158	..	2 16 11
908,000	"	"	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	14 May	6	Hongkong & China, Limited	12–13	..	4 12 4
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	14 May	12	Imperial Continental	249–254	–3	4 14 6
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk "	108–110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	115–118	..	4 4 10
250,000	100	"	4½	Do. 4½ p. c. Debs.	110–112	..	4 0 4
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8½–8¾	..	4 11 5
135,000	5	"	8	Do. New, £4 10s. paid	7½–7¾	..	4 12 10
15,000	5	"	8	Do. do. 1879, £1 paid	1⅞–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5⅛*	+⅛	6 7 3
420,000	100	1 May	6	People's Gas } 1st Mtg. Bds.	105–110	..	5 9 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102–107	..	5 12 1
250,000	10	27 Mar.	10†	San Paulo, Limited	13⅛–14⅛	..	6 18 0
5,475,000	Stck.	13 Aug.	5 7/10	South Metrop., 4 p.c. Ord.	140–145	–11	3 11 8
820,000	"	15 July	5	Do. 5 p. c. Deb. Stk.	173–176	..	2 16 10
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	260–270*	+¾	4 5 2
60,900	"	"	8½	Do. B	180–190*	–¼	4 9 5
170,380	10	29 May	10	Tuscan, Limited.	13½–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	345–350	..	2 18 7
150,000	"	"	5	Do. 5 p. c. Pref.	177–182	..	2 14 11
160,000	"	"	4½	Do. 4½ p. c. Pref. Stk., 1875	160–164	..	2 14 10
175,785	"	27 Mar.	4½	Do. 4½ p. c. Deb. Stock	165–170	..	2 12 11
1,719,514	Stck.	15 Apl.	7	East London, Ordinary	233–238	–4	2 18 9
654,740	"	26 June	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11
100,000	"	"	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	121–125	–2	3 0 0
280,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	..	2 10 11
708,000	Stck.	13 Aug.	12	Kent	347–352	..	3 8 3
160,000	"	"	7	Do. New, 7 p. c. max.	217–222	–3	3 3 0
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	267–272	..	2 15 2
406,200	100	"	7½	Do. 7½ p. c. max.	225–230	–1	3 5 2
350,000	Stck.	27 Mar.	4	Do. 4 p. c. Deb. Stk.	152–157	..	2 10 11
500,000	100	13 Aug.	12 9/10	New River, New Shares	433–438	..	2 18 11
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	157–160	..	2 10 0
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	157–162	..	2 9 4
126,500	100	"	4	Do. Do. 7½ p. c. Max.	150–155	..	2 11 7
489,200	Stck.	"	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 6
1,019,585	"	15 Apl.	4	Do. 4 p. c. A Deb. Stk.	153–156	..	2 11 3
1,155,066	Stck.	12 June	10	West Middlesex	328–333	..	3 0 0
200,000	"	"	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11

*Ex div.

† Next dividend will be at this rate.

—orders having already been largely booked; and, for delivery in the early months of next year, there are sellers at £8 per ton f.o.b.

Nitrate of Soda remains quiet in all positions. On spot, the quotation is 7s. 10½d. per cwt. for ordinary, and 8s. per cwt. for refined quality. Due cargoes are worth 7s. 7½d. and 7s. 9d. per cwt.; while September-October shipments may be had at 8s. to 8s. 1½d. per cwt.; and November-December, at 8s. 3d. to 8s. 4½d. per cwt. Buyers, however, are not interested at these prices.

LONDON, *Sept.* 19.

Tar Products.—Distillers are now a little anxious about the future value of pitch. There appear to be determined efforts to depress this article. Stocks, however, in makers' hands are low; and it is unlikely that they will book business forward at any considerable reduction on former rates. On the other hand, it is well known that fuel makers, who use the great bulk of pitch production, are working from hand to mouth, with no stocks whatever to fall back upon. If the stocks, which have heretofore always been held by users, required to be re-stored, there is not sufficient pitch in makers' hands to do it. There is, therefore, no necessity for lower prices. Solvent naphtha is firm and scarce. Crude naphtha, however, is offering more freely. Benzols are also firm, and scarce for prompt delivery, but are offering more freely for forward. Anthracene presents no new feature; while carbolic acid is very dull.

Values: Tar, 18s. 6d. to 26s. 6d. per ton. Pitch, 31s. Benzols, 90's, prompt, 4s. 7½d.; forward, 4s.; 50's, prompt, 3s. 4d.; forward, 3s. Toluol, 2s. 3d. Solvent naphtha, 1s. 6d. Crude, 30 per cent., naphtha, 1s. 3d. Creosote, 2d.; liquid, 2½d. Heavy oils, 42s. 6d. Naphthalene, pressed, 60s.; salts, 32s. 6d. Cresylic acid, 10d. Carbolic acid, 60's, 1s. 9d. Anthracene, "A," 10½d.; "B," 8½d.

Sulphate of Ammonia.—Manufacturers are now despairing of ever seeing a revival of this article. The market is undoubtedly dull, with little prospect of better rates prevailing. Business has been transacted at £7 10s. to £7 12s. 6d., less 3½ per cent. at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Business in the coal trade of this district still drags on very slowly, and notwithstanding operations have now been resumed after the holiday stoppages at works and mills, there is no really appreciable improvement to notice. Common round coals are just now very plentiful, and also extremely low in price; competition from other districts being most keen. At the pit mouth, best Wigan Arley remains at about 9s. 6d. to 10s. per ton; Pemberton four-feet and seconds Arley, 8s. to 8s. 6d; steam and forge coals, 5s. 6d. to 6s. Shipping continues quiet, with extremely low figures taken; ordinary steam coal being obtainable at 6s. 9d. to 7s. delivered at the ports.

Northern Coal Trade.—The dulness in the coal trade of the North-east has been increased during the last few days, as far as steam coals are concerned; and the tendency of prices is easier. Best Northumbrian steam coals are now to be generally had at 8s. per ton f.o.b.; and second qualities, at 7s. 6d. In the gas coal trade, the demand is now growing very satisfactorily; and both for local companies and for shipment to London enlarged quantities are being asked. After the large contracts are met, the margin for sale is being reduced. Generally the price of best Durham gas coals varies from 6s. 6d. to 7s. per ton f.o.b.; but one coalowner, being largely sold forward, asks 7s. 3d. per ton. Although there are several idle collieries, the work is proceeding satisfactorily at most of the pits; and the production is fully equal to all the needs. In the gas coke trade, there is a little better demand for export and for household purposes; but the production is now increasing more rapidly, and in the case of one or two inland gas-works, the coke stocks are being enlarged. There is no alteration in the price this week.

Scotch Coal Trade.—There is no change in the situation, except that the coalmasters in Lanarkshire have resolved that, the audit of sales having shown no increase in prices, they cannot in the meantime give the miners an advance of wages. The miners are being recommended by their leaders to work only four days a week; but it is doubtful if many are following the advice. There is a large demand for coal, almost equal to the supply; but the supply has the best of it, and there has been no increase in prices. These are quoted as being: Main, 6s. 3d. to 6s. 6d. per ton f.o.b. Glasgow; and ell, 6s. 9d. to 7s. The shipments for the week amounted to 157,077 tons—a decrease on the preceding week of 7280 tons, but an increase on the corresponding week of last year of 16,630 tons. For the year to date, the total shipments have amounted to 5,374,628 tons—an increase over the quantity in the same period of last year, of 229,022 tons.

A Gas Company for Killamarsh, near Rotherham.—Some of the residents of Killamarsh, near Rotherham, assembled last Saturday week for the purpose of considering the advisability of forming a gas company for the district. The matter was exhaustively discussed, and a resolution passed in favour of starting a company. A Committee was appointed to take the necessary steps; and Mr. Fisher undertook the secretarial duties *pro tem.*

Proposed Extension of the Bolton Corporation Electricity Works.—The Bolton Corporation have decided to apply to the Local Government Board for sanction to borrow £30,000 for an extension of the electricity works; this being necessary in consequence of the growing demand for the new illuminant. The adoption of the Brighton system of payment by the Corporation has led to a great many inquiries from intending consumers; and an extension of the works and plant is considered imperative. The expenditure of another £30,000 will bring up the total outlay on the electricity works to £70,000.

FIRST IN 1866.

JOHN WRIGHT & CO., LD.

FOREMOST IN 1896.

THE OLDEST AND LARGEST GAS-STOVE MAKERS IN THE WORLD.

BEFORE ORDERING
SEE OUR
NEW DESIGNS
For 1896-7.

UNEQUALLED,
UNAPPROACHED,
and
WITHOUT
IMPERFECTION.

Lists on Application.
Nos. B 2021 and B 2023
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THE OLDEST AND LARGEST GAS-STOVE MAKERS IN THE WORLD.

FIRST IN 1866.

BIRMINGHAM & LONDON.

FOREMOST IN 1896.

The Huddersfield Corporation Electric Lighting Scheme.—At the meeting of the Huddersfield Corporation last Wednesday, the Chairman of the Electric Lighting Committee (Alderman Calvert) stated that for the half year ended the 30th of June last there had been a deficiency in revenue of £116, as compared with £624 in the corresponding half of last year.

Messrs. W. C. Holmes and Co., of Huddersfield, have secured the order for the remaining portion of the extensions for the North Eastern Railway at Shildon—comprising condensers, boiler, engine, exhauster, purifiers, &c., together with one of their patent scrubber-washers; and they have also on hand new and repeat orders for their patent washer of various sizes to treat from 2½ million to 250,000 cubic feet of gas per diem.

The Glasgow Dynamitards.—A few weeks ago, our Scotch Correspondent noticed the release, on ticket-of-leave, of Thomas Devaney, one of the men who were sentenced to penal servitude for life for complicity in the dynamite outrage at the Tradeston Gas-Works, Glasgow, early in 1883. Another of the gang, named Kearney, *alias* Wallace, has lately been arrested at Rotterdam; and it is understood that he will be brought to trial on the above charge. The police say they have a grand case; and they are now busily engaged in getting up evidence for the prosecution.

North Tawton Water Supply.—Lieut.-Col. W. Langton Cook held an inquiry at North Tawton last Wednesday respecting an application for the sanction of the Local Government Board to a loan of £2500 for improving the water supply of the town. Mr. G. L. Fulford, the Clerk to the Okehampton District Council, stated that the town was now supplied by the North Tawton Water Company, which was established in 1852. The quantity was insufficient for household use, and a greater supply was absolutely necessary for sanitary purposes. The Water Company were prepared to sell their plant and rights to the Council for £402; and it was proposed to carry out a scheme prepared by Mr. H. Geen, the Borough Surveyor of Okehampton, for the improvement of the supply. The principal feature of this scheme is the construction of a storage reservoir with a capacity of 300,000 gallons.

King's Teignton Water Supply.—An inquiry respecting the application of the District Council for power to borrow £2500 for the purpose of supplying the parish of King's Teignton with water, was held last Tuesday by Lieut.-Col. W. Langton Cook, a Local Government Board Inspector. From the statement of Mr. J. Alsop, the Clerk to the Council, and the evidence of Mr. Segar, the Surveyor, it appeared that the population to be provided for was about 2000. The water will be derived from the Holywell spring, in Ugbrooke Park, the seat of Lord Clifford, and will be conveyed in 4-inch mains to the centre of the village—a distance of four miles. Last October the spring was found to yield 259,000 gallons a day; and Lord Clifford has offered a lease of one-fifth of it for a period of sixty years. As the yield had fallen to 162,000 gallons on the 29th ult., Mr. Segar said he proposed to build a small storage reservoir; but the Inspector considered it was not necessary.

Improved Public Lighting at Shoreham.—The Shoreham Town Council have entered into an agreement with the Brighton and Hove Gas Company for the public lighting of the town; and the lamps are to be fitted with the Welsbach burners.

The Rainfall in the Thames Valley.—In their report to the Water Examiner for the Metropolis (Major-General A. de Courcy Scott, R.E.), on the water supply to London during the past month, Professors Crookes and Dewar refer again to the deficiency of rainfall in the Thames Valley. The average for the month was 2·32 inches; and the actual fall at Oxford was 2·01 inches—a deficiency of 0·31 inch. The total deficiency for the present year is 5·97 inches.

Dover Gas Company.—The half-yearly report of this Company was noticed under the heading of "Provincial Gas and Water Companies" in the "JOURNAL" for the 25th ult. Moving its adoption at the recent meeting of the shareholders, the Chairman (Mr. Willsher Mannering) stated that, owing to the mildness of the weather, there had been a decrease of 8½ per cent. in the sale of gas as compared with the first half of last year, when, through the severity of the weather, the output was 10¾ per cent. over the corresponding period of 1894. Considering the decreased consumption by the large number of incandescent burners now in use, and the loss of some of their business through the electric light, he thought an increase of 1·13 per cent. in the sale of gas over the June half of 1894 might be considered very satisfactory; and taking the consumption for the two half years together there had been an average increase of 6 per cent. As to the financial results, with a decreased revenue of £1428 there had been a reduced expenditure of £1344. The total revenue was £14,766, and the expenditure £12,155—giving a profit on the half-year's working of £2611, less only by £85 than the corresponding half year, and within £72 of the amount required to pay the dividend. Coal had cost less by 10d. per ton; but, on the other hand, owing to the further depreciation in the value of sulphate, the receipts were less by £72, and less by £400 than in the June half of 1894. With reference to the public lighting, the whole of the lamps—upwards of 800—had been fitted with incandescent burners. The result had been exceedingly satisfactory—the change had effected a great improvement in the lighting of the town; and the men had got used to attending to the mantles, which were giving but little trouble. The manufacturing operations (under the direction of Mr. R. Herring) had produced the usual excellent results. During the half year, 8120 tons of coal were carbonized; the quantity of gas accounted for being 83,865,500 cubic feet—equal to 10,328 cubic feet per ton of coal. Regarding the future, the Chairman said the prospects were altogether favourable. Coal had been purchased for another year on rather more advantageous terms; they had 53 more consumers; 64 more meters fixed; and 90 more stoves on hire than a year ago. The Directors were also hoping to supply the motive power for the proposed new tramways. They had laid before the Corporation a proposal for the traction of the cars by gas; and the matter had been referred to their officers. The report was adopted; and the full dividend at the rate of 7½ per cent. per annum was declared.

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The "BRIGHTON."
No. 1440.

This is a very handsome fire, with projecting canopy, Ground and Glazed, and Best Stove Enamel finish. It is VERY HOT, and, AFTER MANY SEVERE TESTS, HAS GIVEN VERY SATISFACTORY RESULTS.

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Width „ „	.	17½ „
Back to Front „	.	9½ „
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PRICE . . . . . 25s.

Choke-Damp Burner and Duplex Tap, **3s. 6d.** extra.

New Water-Works for Chippenham.—The Chippenham Town Council propose to borrow £6300 for the purpose of carrying out new water-works, and extending the service to outlying parts of the town.

Reduction in Price.—The Directors of the Alresford Gas Company have decided to reduce the price of gas from 5s. 6d. to 5s. per 1000 cubic feet; while the price to consumers of 10,000 cubic feet in any one quarter will be 4s. 6d. per 1000 feet.

New Joint-Stock Companies.—A Company has been registered, under the title of Rainsford and Lynes, Limited, with a capital of £20,000, in £5 shares for the purpose, among other things, of carrying on the general business of manufacturers of, and dealers in, gas, water, and electric fittings in Birmingham. A Company has just been formed in Brussels, with a capital of £40,000, to be known as the La Société d'Eclairage et Chauffage Intensifs (Bec Rationnel), to acquire certain patents relating to an improved system of lighting and heating.

The Trowbridge Station of the British Gaslight Company.—The statement of accounts for the year ending June 30 relative to the Trowbridge station of the British Gaslight Company has been issued. This revenue account shows that the manufacture of gas cost £4331; and other outgoings brought the total expenditure up to £6049. The receipts from the sale of gas to private consumers came to £5706; public lighting, &c., brought £699; rental of meters and stoves, £391; and residuals, £1241. The total receipts were £2025 in excess of the expenditure. The dividends to which the proprietors are entitled amount to £2345; and £319 has had to be drawn from the reserve to pay the several sums—the fund now standing at £3411. During the year, 4392 tons of coal were carbonized, and 45,161,000 cubic feet of gas made, of which 40,288,605 cubic feet were sold.

The Cost of Opposing the British Gaslight Company's (Norwich) Bill.—The expenses incurred by the Norwich Town Council in opposing the Bill of the British Gaslight Company last session amounted to £688, of which the Gas Company, under an arrangement made with a deputation from the Council, consented to pay £250. It was admitted by Mr. Hackblock, at the last meeting of the Council, that the expenses had reached a larger sum than was expected. It was thought, he said, when the deputation met the Directors of the Company that the costs would amount to something like £500; and the Company agreed to pay £250. But the outlay came to £688 altogether; and he had therefore to move that the Council pay £438. If they did not obtain all they contended for, they gained by the restriction of the amount of capital to be raised by the Company, and the lower rate of interest to be paid upon it. Therefore there would be a less burden on the consumers of gas in future. At Christmas, too, they were promised a considerable improvement in the gas; and other alterations that had been made with respect to the powers of the Auditor would bear fruit in the future. Thus the city was in a better position than before; and he hoped the ratepayers would consider the amount expended was not all loss. The motion was passed.

The Proposed Reorganization of the Staff of the Sheffield Water Department.—Last Tuesday night, at the Walkley Liberal Club, a meeting was held of the Nether Hallam Vigilance Committee, to consider the proposals of the Water Committee as presented at the last Council meeting (*ante*, p. 511), with special reference to the proposed remuneration of the Engineer of the new works. Speeches were made in emphatic terms in opposition to the Committee's recommendations; and a resolution was unanimously passed to requisition the presiding Alderman (Mr. W. E. Clegg) to call a meeting of the ratepayers at an early date to protest against the proposal. A meeting of the Water Committee was held on the following day, under the presidency of Alderman Gainsford, at which the Committee's report was considered. Alderman Carter complained that the proposals of the Sub-Committee had been referred back by the Council, owing to the action of members of the Water Committee itself—members who were, comparatively, strangers to the Committee. He concluded by requesting an alternative scheme from those who opposed the suggestions of the Sub-Committee. Being asked if he had any fresh points to bring forward, or proposals to make, Alderman Gainsford said he had not. Mr. Fisher moved a resolution to the effect that, in carrying out the engineering of the works under the Corporation Act, 1896, a resident engineer of established reputation should be employed at a salary, and that he devote the whole of his time to the work—the Corporation to have power, at their own discretion, in case of any special circumstances or difficulties, to take an engineer's opinion at their own expense. A discussion followed upon this resolution; some later clauses in it, to the effect that an engineer be advertised for in the local and engineering newspapers, not being reached. Eventually the discussion was adjourned till the 7th prox.

The Gas Supply of Hamburg.—The financial report on the gas and electricity works at Hamburg for the year 1895 has recently been issued. The make of gas amounted to nearly 1049 million cubic feet. This is about 1 per cent. less than that of the previous year. The decrease is attributed to the recent very wide extension of the area of electrical supply; but since, concurrently with the decrease in the quantity of gas burnt, the number of consumers has increased considerably, the spread of incandescent gas lighting must be held as jointly responsible for it.

The Wages of Leeds Gas Workers.—About a year ago the Leeds branch of the Gas Workers' Union made an application to the Gas Committee of the Corporation for an increase of wages; and at that time the Committee granted some few concessions, but in the main the application was refused. A similar application came before the Gas Committee at their meeting last Thursday; and the gas workers, in their letter, asked the Committee to receive a small deputation consisting of the officials and some of the workmen, in order that they might have an opportunity of urging their claims. The Committee decided to accede to the request; and a meeting for the purpose will be called at an early date.

Proposed Extension of the Brighton Water-Works.—The Water Committee of the Brighton Corporation have resolved to present a report to the Town Council recommending the extension of the water-works at Patcham, at an estimated cost of £12,000. The Committee state that a fissure yielding 600,000 gallons of water per 24 hours has been struck in the western heading at Patcham; and for the utilization of this increased supply it will be necessary to extend the works. Mr. J. Johnston, the Water Engineer, recommends that two covered service reservoirs shall be built, the top water-level of one to be 216 feet above Ordnance datum, and to hold a million gallons; and the second to have a top water-level of 300 feet, and contain half a million gallons. By carrying out these and the incidental works, it is estimated that a saving of £150 per annum would be effected in coal, besides providing an increased water supply.

Lynn Water Supply.—The Lynn Town Council have recently had some very prolonged, but to a certain extent profitable, discussions on the best means of providing a new water supply for the town. At their last meeting, Mr. Bardell, a member of the Council, brought forward a scheme of his own, by which, he contended, a supply of water might be obtained by gravitation. He spoke at some length in support of his contention; stating that the pumping-station scheme before the Council would cost £36,589, whereas a gravitation scheme would cost only £29,000. The annual cost by pumping would be £4305; and by gravitation, £2680. Mr. Mansergh, in his report, had, he said, advised them to adopt the gravitation scheme; and he therefore moved that the pumping scheme be abandoned. Mr. Carpenter seconded the motion. Mr. E. J. Silcock, the Borough Engineer, was called in, and, in the course of some explanatory remarks, said the scheme Mr. Bardell proposed would cost about £50,000, and was quite different from his (Mr. Silcock's) proposal. Mr. Bardell had based his calculations upon wrong figures, and consequently his conclusions were erroneous. Mr. Hill, one of the most eminent water engineers, had pronounced very definitely against Mr. Bardell's scheme; and this fact was, in itself, sufficient for him (Mr. Silcock). On a division, the motion was lost.

The Management of the Milton-next-Sittingbourne Gas-Works.—The management of the gas undertaking of the Milton District Council appears, from what transpired at the meeting of that body last Tuesday, to be causing them a great deal of trouble. First of all, a question arose as to who should collect the pence from the coin meters; and in the result the work was put upon the collector of the gas-rates. Then some muddle had arisen owing to no check being kept on the sales of residuals; and the Gas Committee were instructed to bring up a report on the matter. Next a suggestion was brought forward to reconsider the question of lowering the price of gas, as there was likely to be a deficiency in the accounts. Mr. Cleaver, who broached this subject, said that a profit of £400 which had been shown for nine months' working had entirely disappeared. Mr. Simmons added that the £400 dwindled down to £100; and then they found that there was a sum of £48 in hand, and coke valued at £50. But even this had vanished. He wanted to know how things really stood at the gas-works. It was admitted that they had lost 25 per cent. at the gas-works, according to the Board of Trade returns. Again, the charge for public lighting was 21 per cent. more than it ought to be, for it should be 10 per cent. less than the price charged to private consumers; and yet the works did not pay. Eventually, the whole question of the management of the gas-works was referred to the Committee.

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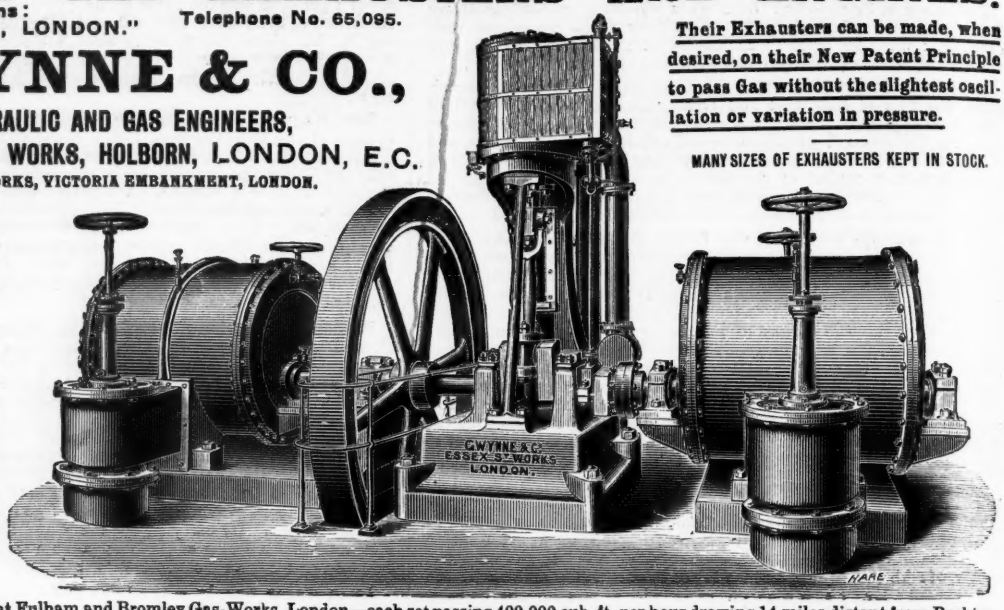

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CONTRACT FOR CANNEL.

THE Gas Committee invite Tenders for the supply of good CANNEL for One, Two, or Three Years, at the rate of about 5000 Tons per annum, to be delivered at their Siding (on the Midland Railway) in Ashwood Dale, Buxton.
Tenders, endorsed "Tender for Cannel," addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall not later than noon on the 30th inst.
Forms of Tender and other Particulars may be obtained of Mr. Geo. Smedley, Gas Department, Town Hall, Buxton.
The Council do not bind themselves to accept the lowest or any tender.
By order,
JOSIAH TAYLOR,
Clerk to the Council.
Buxton, Sept. 14, 1896.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz. Liquor) for One Year, from the 1st day of October, 1896.
The Tar will have to be removed in Barrels; but the Liquor can be pumped into Railway Tanks on the Great Western Railway.
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The Directors do not bind themselves to accept the highest or any tender.
Any further Information may be obtained on application to Mr. J. Wadeson, Manager.
Sealed tenders, stating price at the Company's Works free of all charges, must be sent in by Twelve o'clock at Noon on Tuesday, the 6th day of October, 1896.
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(GAS DEPARTMENT.)

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Further Particulars and Form of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Five p.m., on Thursday, Sept. 24, 1896, addressed to the Chairman of the Gas Committee, Town Hall, Salford.
By order,
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
Sept. 16, 1896.

SOWERBY BRIDGE URBAN COUNCIL DISTRICT.

THE Gas Committee of the Sowerby Bridge Urban District Council are prepared to receive TENDERS for the construction of a STEEL TANK and THREE-LIFT GASHOLDER.
Each party or firm tendering to furnish his own Designs and Specifications.
All Particulars respecting Gasholder and Tank may be obtained on application to Mr. John Marsland, Manager, Gas-Works, Sowerby Bridge.
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Sowerby Bridge, and
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Sept. 10, 1896.

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By Order of the Directors.

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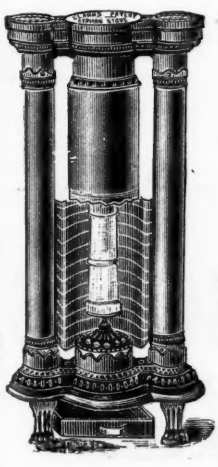
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.
Nov. 30, 1895.



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NO DIRT OR TROUBLE. NO DANGER.
The "SYPHON" Stove produces A PURE, EQUABLE, AND AGREEABLE HEAT, which can be graduated or sustained at the will of the user.

The most economical and convenient Heating Apparatus for all classes of Dwellings, and eminently suited for ENTRANCE HALLS, BEDROOMS, CONSERVATORIES, SHOPS, OFFICES, GALLERIES, CONCERT ROOMS, YESTRIES, &c., &c.

S. CLARK & CO.,
Patentees and Sole Makers,
SYPHON WORKS, PARK ST., ISLINGTON, LONDON, N.
Telegraphic Address: "SYPHON STOVES, LONDON."

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.

Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

SELF-ENRICHMENT OF COAL GAS

(Shadbolt and Broadhead's Patent).

Two Candle Extra Illuminating Power may be obtained by this Process without the aid of Supplementary Enrichers.

For further Particulars, Prices, and Royalty, apply to the Sole Agents and Licensees—

R. DEMPSTER & SONS,

Limited,

ELLAND, YORKS.

"Invaluable to those engaged in lighting or water works."—ENGINEERING.

Now Ready for 1896.

TWENTIETH YEAR OF ISSUE.

GAS and ELECTRIC LIGHTING COMPANIES' DIRECTORY and STATISTICS,

With List of Officials, Engineers, and Managers,

Price, Cloth, 6s.

WATER COMPANIES' DIRECTORY and STATISTICS,

With List of Officials, Engineers, and Managers,

Price, Cloth, 6s.

THE TWO VOLUMES IN ONE, 10s.

LONDON: HAZELL, WATSON, & VINEY, LTD., 1, CREED LANE, LUDGATE HILL.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

Price 5s. per 100.

THE USE OF
GAS LIME IN AGRICULTURE.

By Dr. A. VOELCKER.

A 4pp. Leaflet for Distribution among Farmers and others.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON, FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON, W.C.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,

165, QUEEN VICTORIA STREET, E.C.,

And at STROUD, GLOUCESTERSHIRE.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

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90, CANNON STREET, E.C.

WENHAM LAMP.

WEBER & CO., Steatite Makers,

12 & 13, BRIDGEWATER STREET,

LONDON, E.C.

Now supply direct to the Trade, **RINGS** and **BUTTONS**, same Quality and Sizes as we manufactured exclusively for the late Wenham Company; and **WE ALLOW MUCH HIGHER DISCOUNTS.**

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.

B Lombard Street, NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

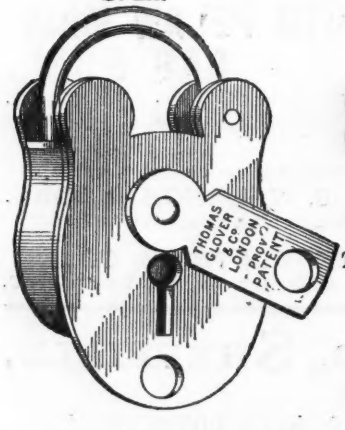
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

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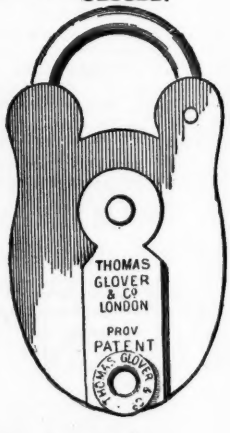


THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:
62, VICTORIA STREET,
Telegraphic Address: "GOTHIC."

BIRMINGHAM:
1, OOZELLS STREET.
Telegraphic Address: "GOTHIC."

MANCHESTER:
37, BLACKFRIARS STREET,
Telegraphic Address: "GOTHIC."

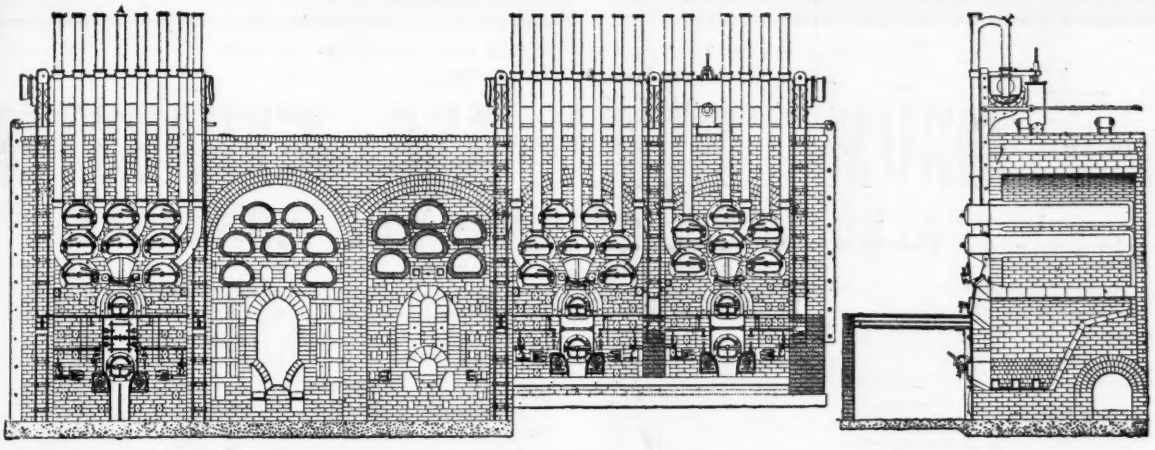
JAMES MILNE & SON, LTD.,

GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

LONDON. — GLASGOW. — LEEDS.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non.*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

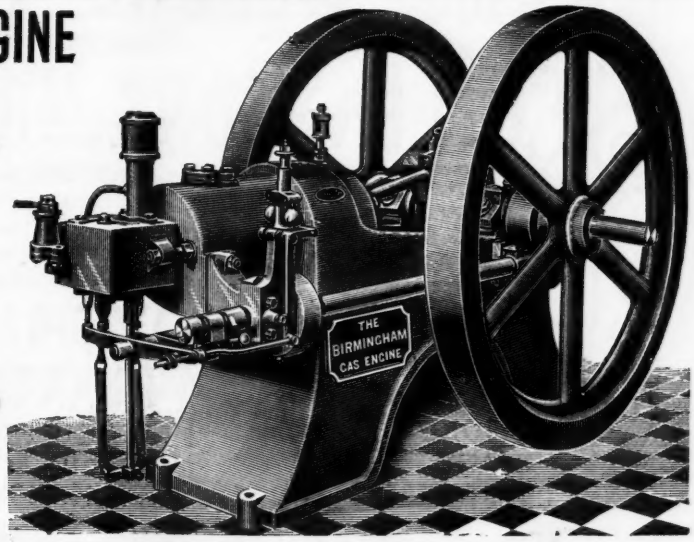
Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

THE BIRMINGHAM GAS-ENGINE

"OTTO" CYCLE.

A thoroughly reliable Engine for Commercial or Electric Lighting Purposes. Simple, Strong, Interchangeable.

Adopted by the Corporation of Birmingham Gas Department for Driving the Conveyors at their Swan Village Works.



WILLIAM GRICE & SONS,

Engineers and Founders,

FAZELEY STREET, BIRMINGHAM.

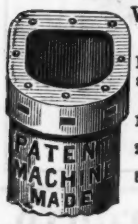
LONDON REPRESENTATIVE: Mr. SAM PUPLETT, M.I.M.E., 47, Albany Buildings, Victoria Street, Westminster.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,

Near LEEDS,



Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS,

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

AGENTS FOR

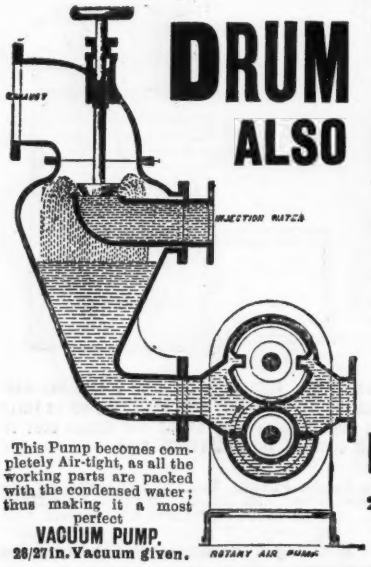
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

JOHNSON'S PATENT

DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect

VACUUM PUMP.

26/27in. Vacuum given.

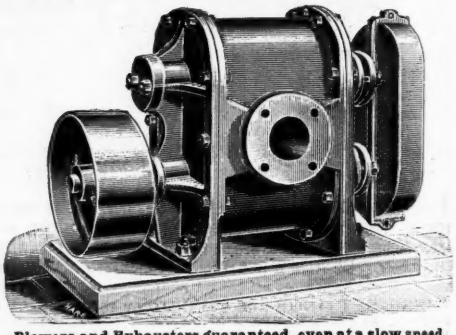
No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

27, CHARLES ST.,

BRADFORD.



Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 2 lbs. and upwards, and this without losing power by creating frictional Heat.

TANKS ROOFS

CUTLERS PATENT TUBULAR GAS CONDENSER SUITABLE FOR GASWORKS OF ALL SIZES, AND FOR ANY CLIMATE OVER 100 ERECTED

MAKERS OF GASHOLDERS OF EVERY SIZE AND TYPE

HUNT'S PATENT WASHER, IS THE ONLY APPARATUS NECESSARY BETWEEN THE CONDENSER & PURIFIERS. IT REQUIRES NO MOTIVE POWER

TELEGRAMS "RETORTUS LONDON"

NATIONAL TELEPHONE 5059.

S. CUTLER & SONS, MILLWALL LONDON

FOREIGN AGENTS

A SPECIALTY

STEEL TANKS FOR GASHOLDERS AND OIL STORAGE.

IMPROVED SYSTEM OF CARBURETTED WATER-GAS PLANT PARTICULARS ON APPLICATION.

COLONIAL AGENTS

CUTLER'S FREEZING PREVENTER IS THE BEST APPLIANCE FOR PREVENTING FORMATION OF ICE IN GASHOLDER CUPS. IT IS IN USE AT MANY IMPORTANT WORKS IN ENGLAND, GERMANY, AUSTRIA, AND AMERICA

ELECTRIC FITTINGS

DYNAMOS MOTORS

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 „	Preston	1,500,000 „
Glasgow	300,000 „	Southport	750,000 „
Brussels	700,000 „	Bath	1,000,000 „
Liverpool	3,500,000 „	New York	1,200,000 „
Tottenham	750,000 „	Newburgh, N.Y.	350,000 „
Santiago	400,000 „	Tottenham (Second Contract)	750,000 „
Swansea	750,000 „	St. Joseph, Mo.	750,000 „

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Edinburgh	2,000,000 Cub. Ft.
Shanghai	225,000 „	Stockton-on-Tees	500,000 „
Winchester	200,000 „	Stockport	500,000 „
Hoylake	125,000 „	Norwich	1,000,000 „
Manchester	3,000,000 „	Guildford	350,000 „
Brussels (Second Contract)	700,000 „	Syracuse, N.Y.	850,000 „
Holyoke, Mass.	600,000 „	Bordentown, N.J.	125,000 „

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W.

Telegrams: "EPISTOLARY, LONDON."

United States Office, 64, Broadway, New York.

R. DEMPSTER & SONS, L.D.

ELLAND, YORKS.

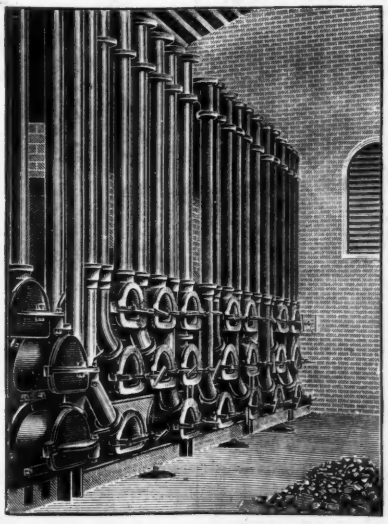
GENERATOR & REGENERATOR FURNACES & SETTINGS

GIVING VERY BEST RESULTS.

LEOMINSTER.

This COMPANY write—

"Mr. Chester's Furnaces and Settings you have erected for us work exceedingly well. Splendid heats under easy control. Nearly **50** per cent. less Coke used for Fuel than formerly. Very convenient for Sunday stopping. Work done in a thorough manner, to our entire satisfaction."



MATLOCK BATH.

Mr. LISTER writes that—

"The result of using Chester's Furnace and Setting for first Six Months of 1896 was to produce 26,000 cubic feet more gas, using 35 tons less coal, and having 171 tons more coke for sale, compared with same period of 1895."

ILLUSTRATION OF Mr. CHESTER'S REGENERATOR FURNACES AND SETTINGS RECENTLY ERECTED BY US AT CLEETHORPES, ABOUT WHICH Mr. BROCKWAY WRITES—

"Can make 8000 to 9000 per mouthpiece easily with **Mr. Chester's Regenerators** you have erected for us. Fuel Consumption much less than with our Generators. Heating of Retorts very even. Very well pleased with working. Results exceed expectations."

CASES FOR BINDING VOLUMES OF THE "JOURNAL,"

(GREEN CLOTH, GILT LETTERED)

MAY BE HAD OF THE PUBLISHER,

PRICE 2s. EACH.

BOWENS' Ltd. Successors, STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

HARPER & MOORES, STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

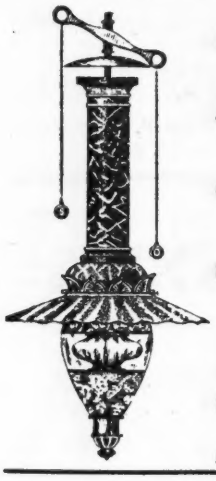
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

The Climax of Regenerative Gas Lighting!!



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[See Illustrated Advertisement, Sept. 1, p. 436.]

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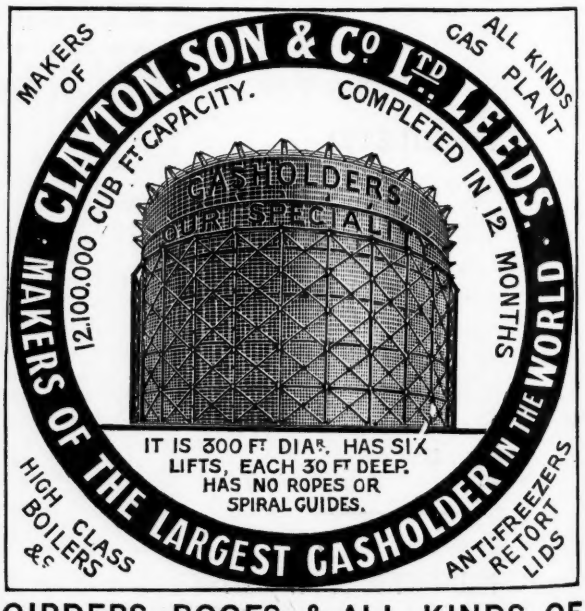
[See Illustrated Advertisement, Sept. 1, p. 437.]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ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

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Over 292,000,000 Cubic Feet of Gas per Day is passing through about 550 of these Machines.

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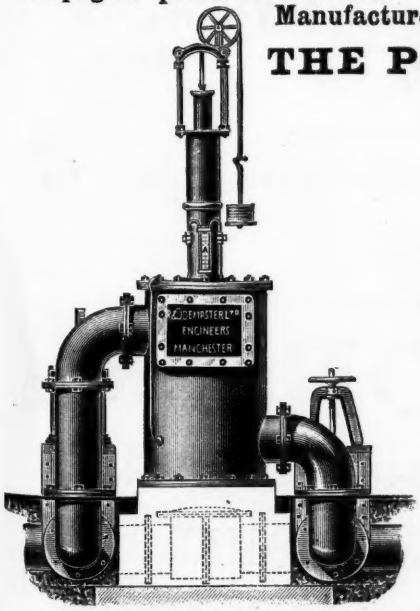

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This Apparatus is in very general use in most of the Gas-Works on the Continent and in America; over **550** being in use in different parts of the World for condensing and arresting all Tar Particles and Vapours from the Gases from Coal, Oil, and Wood.

The large number in use is sufficient proof of its utility. By the almost complete elimination of Tar, which is effected to the extent of 99·7 per cent., it facilitates Purification in the Purifiers, by preventing the clogging or obstruction of the Purifying Materials, which, in consequence, last much longer; thus effecting a Saving both in Materials and Labour.

So effective is this Apparatus that a piece of white paper placed over a Test-Tap on the Inlet of the Machine is immediately covered with Tar, whilst on the Outlet the white paper remains perfectly clean.

The Machines are made in the following sizes, for Works producing per 24 hours—

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0	35,000	5	500,000
1	70,000	6	700,000
2	140,000	7	1,240,000
3	210,000	8	1,750,000
4	350,000	For larger Makes, two Machines are recommended.	

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[See also Advt. p. 538.

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